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DESIGN OF AN ANALYTICAL SYSTEM FOR THE DETECTION AND MONITORING OF A NUMBER OF HAZARDOUS MATERIALS

PART I

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DESIGN OF AN ANALYTICAL SYSTEM FOR THE DETECTION AND MONITORING OF A NUMBER OF HAZARDOUS MATERIALS

by

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DESIGN OF AN ANALYTICAL SYSTEM FOR THE DETECTION AND MONITORING OF A NUMBER OF HAZARDOUS MATERIALS

PART I

APPLICATION OF DRAGER TUBES, HACH DR-EL/4, OVA AND HNU EQUIPMENT

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1. INTRODUCTION

1.1 General

The studies reported in this Report were proposed by the Environmental Emergency Branch (EEB) of the Environmental Protection Service (EPS). The proposals were based on studies within the EEB, and particularly on a study carried out for the EEB in 1980-81 and reported on April 2, 1981 to EEB (1).

The 1980-81 study made recommendations concerning equipment felt to be suitable for the detection and monitoring of a number of hazardous materials, and these recommendations cited specific testing tubes (Drager), field testing kits (HACH DR-EL/4, field gas sniffer and chromatographic units (OVA), detection units (HNU), microprocessed UV and IR spectrophotometers (P-E Model 552 UV; P-E Model 683 IR) and on-line computer linkage for the UV and IR units (Radio Shack TRS80, Mark III computer).

This Contract and two previous Contracts (DSS File Nos. 23SU.KE204-1-0111 and 51SS.KE145-1-1569; Serial Nos. 0SU81-00206 and 0SS81-00183) were intended to carry out experimental work on these units, as purchased and supplied to the project by EEB, in order to determine their ability to provide quantitative responses to the hazardous materials stipulated in the mandates for the Contracts.

The general objective of the study was to provide systems able to detect, identify and quantify hazardous substances at spill sites. The systems were to operative relative to air, water or sediment/soil samples.

Three levels of detection/quantification were to be implemented, and these were:-

1. Level I - Drager tubes
2. Level II - HACH kit, OVA, HNU
3. Level III - Computerized UV/IR spectrophotometry

The general features of each level are indicated in the following.

1.1.1 Level I methods

Drager tubes

The objective of Level I testing is to determine relatively small concentrations of a contaminant (or contaminants group) in air samples, and to do this with maximum reliability and in minimum time. The purpose of such determinations is to indicate quickly and easily whether the contaminant(s) involved exists at a concentration above an admissable level. At spill sites, Level I testing would be expected to provide, within the limits of the testing tube used, initial data concerning the concentration of a contaminant(s) in the air.

Drager tubes are designed to meet this need. There are about 100 different tubes available in the Drager gas detection system. As normally used, a measured amount of the air sample is drawn through the active material in the tube, whereupon a colour change reaction takes place on the solid reagent carrier. The determination of the level of the particular contaminant involved is obtained by either matching the degree of colour change against colour/concentration standards, or by measuring the distance the colour change has traveled through the tube and comparing it with a calibrated scale.

The Drager tube system can only be applied to air samples taken at temperatures approximating 20°C. The results are semi-quantitative and, where circumstances require more accurate testing, Level II and/or Level III methods must be applied.

1.1.2 Level II methods

HACH DR-EL/4 kit

This kit, properly called the Direct Reading Engineer's Laboratory, is a self-contained, portable field kit for the quantitative determination of about 30 different substances of a hazardous nature that are commonly found in potable or waste waters. The individual analyses are generally carried out by titrimetric or colorimetric means, although conductometric measurements can also be applied. While designed primarily for the testing of water samples, the study group adapted the general techniques to the treatment of a number of solid hazardous substances alone or as soil incorporations.

A number of "spot" tests can be carried out by the kit. These tests can determine whether or not a given contaminant is present at a limiting concentration, but they are not capable of being applied in the form of quantitative determinations.

In general, a sample of the water medium is tested without pretreatment, dilution or concentration steps being required.

OVA (organic vapour analyzer) Model 128, GC option

This unit is a highly-sensitive instrument designed to measure trace quantities of organic materials in air sample media. It employs what is essentially a hydrogen-flame ionization detector (FID) with sensitivities in the ppm v/v range, and can operate in the presence of moisture, oxides of nitrogen and carbon dioxide.

The unit measures organic vapour concentrations by the comparative method; the response to a sample of air of unknown contaminant concentration is compared with the response yielded when a contaminant mixture of known concentration is tested. Although the instrument is first calibrated against methane, the sensitivity of the FID varies from one organic vapour to another, and the unit must be calibrated for each organic compound of interest.

When the instrument is operated in the normal survey mode (sniffer mode), a continuous sample is drawn through the probe into the detector chamber by means of an internal pumping system. Within the detector, the sample is burned in the hydrogen flame, and this combustion produces positively-charged, carbon-containing ions which are collected by a negatively-charged electrode in the chamber. The resulting ion current is measured and an output signal results which is proportional to the number of ions collected. The signal is amplified for subsequent display as quantitative data on the readout meter or external recorder.

In the "sniffer" mode, all FID-sensitive vapours present in the air sample are measured simultaneously. Thus, if there are two or more organic substances in the air sample under study, the OVA will give a single response proportional to the total concentration of the organic vapours present.

If it is necessary to separate and quantify the individual components of such a sample, the OVA must be operated in the "GC" mode. In this mode of operation, the sample is injected into the GC column. The components are separated and eluted individually into the detector chamber where each FID response is measured. Qualitative analysis is based on the retention times for the various components, with quantitative data being obtained by measurement of the individual peak areas (triangulation) of the recorder chart. Comparison with known standards is required, so that this best applied to samples taken at the spill site and returned to the base laboratory.

HNU PI-101 (photoionization detection) system

The HNU is a UV photoionization detector system capable of determining in air samples those organic vapours as contaminants which are sensitive to photoionization detection at 10.2 eV. Since the response varies from one organic substance to another, the HNU must be calibrated for each compound of interest. The initial calibration of the unit involves the use of benzene. Mixtures of applicable organic substances will provide for a total response.

Qualitative analysis is not possible, nor is quantification possible except in the analysis of air samples containing only one photoionization-sensitive substance. This is, in itself, not necessarily severely restrictive, since many spill incidents involve situations where only one organic contaminant substance of a hazardous nature must be quantified.

1.1.3 Level III methods

UV/IR computer-linked methods

Although Part I (this particular Report section) covers only the Levels I and II methods, some general statement must be included concerning Level III techniques. The microprocessed UV and IR units, linked to the on-line computer, are capable of providing for the quantification of many organic vapours representing hazardous contaminants in air samples. Soil/sediment samples can also be handled with special approaches.

Qualification and quantification are possible and, with restrictions, air samples containing more than one contaminant can be investigated. Very generally, the operational principle involves logging into the computer banks the UV and/or IR data involving, for example, wavelength, extinction coefficient, calibration data, etc., for each organic compound of interest and responsive to UV and/or IR spectroscopic examination techniques. Recall of this information involving operational settings for any logged compound and the subsequent introduction of the sample to be analyzed results in the provision of ratio data covering the response factor for the unknown and the response factor/concentration data from logged standard-samples information. From this ratio data, the concentration of the contaminating analyte in the air sample can be obtained by simple calculation.

1.2 Priorities for Hazardous Substances and Test Media

1.2.1 Priority lists for hazardous substances

The lists for priority hazardous substances, as stipulated by the EEB for this study, are shown in Appendix A. The 1980-81 study (1) had suggested (Section 2.1) priority listings for hazardous substances normally shipped in gas, liquid or solid form. The groupings shown were arranged as to priorities on the basis of:-

(a) Ability to contaminate the air

(b) Ability to contaminate water or soil/sediment

(c) Degree of danger to human health

(d) Probability of a spill based very generally on the frequency/quantity of shipments

(e) Possibility of additional hazard in the event of fire

The compounds stipulated by the EEB as priority hazardous substances are listed in fair agreement with these suggestions.

1.2.2 Priority of test media

In general, the order of importance relative to the test media was established as:-

1. Hazardous substances in air media
2. Hazardous substances in water media
3. Hazardous substances in soil/sediment media

The test procedures are fairly simple for air media work, but can become somewhat more complicated with respect to the testing of water and soil/sediment samples. These latter two media require that consideration be given to the methodologies of sampling and introduction of the samples acquired to the particular testing equipment involved (e.g. GC, UV or IR).

1.2.3 Priority of analytical location

Acquired samples of any media can be tested in the field (at the spill site), at portable test areas (equipment located in a carrier nearby) or in a fixed laboratory (this could be a well-designed carrier nearby or base laboratory). It is at once apparent that the order of importance is exactly the line-up shown; namely that the descending order of priority is field testing, portable testing and laboratory testing. The need for, first of all, rapid and accurate field testing techniques is paramount, and it is towards this area that this initial experimental program was directed.

1.3 Progress of the Experimental Investigations

A Report (2) was made on July 15, 1982 which covered progress made relative to the Contracts covered by DSS File Nos. 23SU.KE204-1-0111 and 51SS.KE145-1-0509; DSS Serial Nos. 0SU81-00206 and 0SS81-00183. This Report outlined and reported on progress made relative to Drager tube testing, HACH DR-EL/4 kit studies, OVA and HNU programs, and UV/IR/TRS80 Mark III work.

It would be redundant here to repeat the details involved. Suffice it to say that, while the Drager tube and HACH kit approaches were well in hand at the time of preparation of the Report, the OVA, HNU and UV/IR/TRS80 experimental work had been delayed due, in short, to the following problems. Detailed outlines of the various problems can be found in (2).

1. Difficulties were encountered with respect to deliveries and operational malfunctions involving the OVA equipment.
2. Calibration and breakdown problems were experienced initially with the HNU units.
3. Difficulties were encountered relative to the setting of the UV/IR/TRS80 system into operation.
4. Although the manufacturers of the OVA equipment recommended the one-time use of green plastic garbage bags for the preparation of standard gas mixture samples for calibration purposes, reaction/absorbance situations were encountered when this practice was carried out with many of the hazardous substances requiring investigation. Initially, this usage resulted in a considerable delay in the program, until accumulated data indicated the unreliability of the technique. Further delays were then experienced in obtaining the aluminized polyester (Mylar) sample bags required to carry out properly the standard gas mixture calibration programs.
5. Because of these felaying factors, preparation of the OVA, HNU, etc., field manuals were correspondingly delayed.

As a direct result of these problems, an additional Contract for 1982-83 was issued to permit completion of the various work phases. This was DSS File No. 28SU.KE145-1-0803, Serial No. OSU82-00022. This Report, which is Part I, covers the general experimental work and results for the HACH kit, OVA and HNU approaches. Field Operational Manuals covering each of these items of equipment have already been completed and submitted to the EEB. These Manuals are covered by references (3), (4), (5), (6).

The UV/IR/TRS80 Mark III Field Operational Manual, and the general Report, Part II, on this approach, will be forthcoming in the near future.

2. EXPERIMENTAL RESULTS FOR LEVEL I AND LEVEL II SYSTEMS

2.1 Drager Tube Usage Investigation - Level I

The testing work, reporting and conclusions relative to the use of Drager tubes in the testing of air samples at spill sites can be found in (2). No further work was carried out for this Contract in this connection, so that all of the relevant details involved may be found in (2), Sections 2.1.1 to 2.1.3.

2.2 HACH DR-EL/4 Kit Investigations - Level II

2.2.1 General

The major portion of the testing involving the HACH DR-EL/4 Kit for the testing of water samples at spill sites was completed and reported, with associated conclusions, in (2), Sections 2.2.1 to 2.2.4. Experimental work covering additional hazardous substances in water samples, and involving the HACH kit directly, were subsequently carried out, and these are reported in the sections following. A laboratory manual which covers all of the HACH kit tests was prepared and submitted as (3).

In addition to this program, methodologies were devised to cover the quantification of certain hazardous substances in soil/sediment and spilled material samples. These substances were essentially those with relatively poor solubility in water. While these tests do not reflect the HACH DR-EL/4 kit or its associated system, they can be carried out in connection with the use of some of the kit-based equipment. These methods

methods are also reported in the following. A laboratory manual covering the application of the methods has been prepared and submitted as (4).

2.2.2 HACH DR-EL/4 Kit tests additional to those reported in reference (3)

2.2.2.1 Aluminum in waters

This test, page 2-13 of the DR-EL/4 Manual, is intended to determine the aluminum content of water and waste water samples. The method involves the use of an addition of "Aluminon" (calcium salt of aurintricarboxylic acid) to a buffered solution of the water sample. A reddish lake is formed when aluminum is present. One-half of the sample is bleached by the addition of fluoride and is used as a blank. The blank and the unbleached solution portion are measured as to intensity with an Aluminum (Aluver 3 Method) Meter Scale, using a wavelength of 522 nm. The readout is given directly as ppm aluminum.

Standard water samples containing aluminum as the chloride, sulphate, nitrate and hydroxide compounds were tested. The results are shown in Table 2-1.

It will be noted that the test results for aluminum as the chloride, sulphate and nitrate salts show excellent agreement with the standards. The results for aluminum as the hydroxide showed consistently low values, an average of 25 percent low being obtained. It is apparent that relative insolubility in water of the hydroxide dictates that problems may be encountered in the exact quantification of aluminum under such circumstances.

TABLE 2-1

ALUMINUM DETERMINATION - DR-EL/4 MANUAL, PAGE 2-13

Aluminum salt	Standard strength (ppm Al equivalent)	Test value (ppm Al equivalent)
Aluminum chloride, $AlCl_3$	0.75	0.68
	0.50	0.45
	0.25	0.21
Aluminum sulphate, $Al_2(SO_4)_3.18H_2O$	0.75	0.73
	0.50	0.47
	0.25	0.24
Aluminum nitrate, $Al(NO_3)_3.9H_2O$	0.75	0.74
	0.50	0.51
	0.25	0.27
Aluminum hydroxide, $Al(OH)_3$	0.75	0.59
	0.50	0.36
	0.25	0.18

Available Range: 0 - 0.75 ppm aluminum

Conclusions

1. The HACH method for the determination of aluminum in water samples gives excellent results when applied to soluble aluminum salts such as the chloride, sulphate or nitrate. Difficulties may be encountered when relatively insoluble or complexed aluminum compounds are present as the water contaminant.
2. The buffering of the water sample prior to the addition of the "Aluminon" salt is important, so that excessive acidity/alkalinity should be absent.
3. Adequate stocks of all expendable reagents and solutions should be maintained at home-base.

2.2.2.2 Barium in waters

The determination of barium in water and waste water samples is covered by this test. The technique is turbidimetric, and is described on page 2-31 of the DR-EL/4 Manual. The addition of a chloride-containing compound to the water sample results in the development of a white turbidity due to barium chloride in the presence of barium. A blank sample consists of the untreated water.

The blank is examined first, using the Barium (BariVer 4 Method) Meter Scale and a wavelength setting of 450 nm. The meter reading is then adjusted to 0 mg/liter Ba. The treated sample is then examined. The readout is given directly as ppm barium.

Separate standard water samples were prepared, and these contained barium as the hydroxide, carbonate, sulphate and nitrate salts. The results

TABLE 2-2

BARIUM DETERMINATION - DR-EL/4 MANUAL, PAGE 2-31

Barium salt	Standard strength (ppm Ba equivalent)	Test value (ppm Ba equivalent)
Barium hydroxide, $Ba(OH)_2$	insufficiently soluble	
Barium sulphate, $BaSO_4$	insufficiently soluble	
Barium nitrate, $Ba(NO_3)_2$	0.0	0.0
	50	48.0
	100	97.5
	200	192.0
	300	295
Barium carbonate $BaCO_3$	0.0	0.0
	50	50.0
	100	99.0
	200	195
	300	295

Available Range: 0 - 300 ppm barium

are shown in Table 2-2.

It was found that the barium hydroxide and barium sulphate salts were insufficiently soluble to yield anything in the way of useful data. The test results for barium as the nitrate and carbonate salts showed excellent agreement with the standards. It is apparent that the methodology is applicable only where soluble barium salts are involved.

Conclusions

1. The HACH turbidimetry method for the determination of barium in water samples gives satisfactory results with soluble (and perhaps uncomplexed) salts are present.
2. Adequate supplies of expendable reagents and solutions should be maintained at home-base.

2.2.2.3 Boron in waters

This test is capable of the determination of boron in water and waste water samples. The test is outlined in the DR-EL/4 Manual, page 2-35. The addition of carminic acid to the water sample results, in the presence of boron, in the development of a reddish-blue colour. The presence of strong sulphuric acid is essential to the proper development of the colour. A blank sample consists of demineralized water with the usual addition of sulphuric acid.

The blank sample is examined first, using the Boron (boriVer 3 Method) Meter Scale and a wavelength of 605 nm. The meter reading is then adjusted to 0 mg/liter boron. The treated sample is then examined. The

TABLE 2-3

BORON DETERMINATION - DR-EL/4 MANUAL, PAGE 2-35

Boron salt	Standard strength (ppm B equivalent)	Test value (ppm B equivalent)
Boric acid, H_3BO_3	0.0	0.0
	5.0	4.5
	10.0	9.8
	15.0	14.5
Sodium borate, $NaBO_2.4H_2O$	0.0	0.0
	5.0	5.0
	10.0	9.5
	15.0	15.5

Available Range: 0 - 15 ppm boron

readout is given directly as ppm boron.

Separate standard water samples were prepared, and these contained boron as boric acid and sodium borate. The results are shown in Table 2-3.

The results show excellent agreement with the standards. It should be mentioned that sodium borohydride was also used in the preparation of a standard series, but that inconsistent results were obtained.

Conclusions

1. The HACH test for the determination of boron in water samples gave excellent results in the examination of boric acid and sodium borate solutions. Inconsistent results were obtained for samples containing boron as sodium borohydride.
2. Adequate supplies of all expendable reagents and solutions should be maintained at home-base.

2.2.2.4 Cyanide in waters

This test, covered by the DR-EL/4 Manual, page 2-89, is intended to determine cyanide ion in water and waste water samples. The method depends on the addition of various reagents to react the cyanide ion as follows:-

Cyanide + chlorine → cyanogen chloride
Cyanogen chloride + pyridine → intermediate nitrile
Intermediate nitrile hydrolized → glutaconaldehyde
Glutaconaldehyde + pyralozone → blue dye

The intensity of the blue dye colour is measured at 612 nm, using the Cyanide (CyaniVer Method) Meter Scale. The meter readout is directly in ppm cyanide. An untreated water sample is required as a blank.

Standard solutions were prepared containing cyanide as sodium cyanide, acrylonitrile and sodium dichloroisocyanurate. Only the first compound proved to yield adequate solubility and/or adequate reaction characteristics. The results are shown in Table 2-4.

It will be noted that, for soluble cyanide-ion yielding inorganic salts such as sodium cyanide, the test results agree very well with the solution preparation data.

Conclusions

1. The HACH method for the determination of cyanide ion in water samples is satisfactory when applied relative to inorganic cyanide ion salts such as sodium cyanide.
2. Adequate supplies of expendable reagents and solutions should be maintained at home-base.

2.2.2.5 Lead in waters

Lead in water and waste water samples can be determined by this technique as outlined in the DR-EL/4 Manual, page 2-126. The method involves the extraction of a buffered water sample with chloroform-dithizone solution. In the presence of lead, the chloroform layer shows a pink colour. The intensity of the colour is measured at 515 nm, using the Lead (DithiVer Method) Meter Scale. Pure chloroform is used as the blank.

Standard water solutions were prepared to contain lead chromate, lead oxide (PbO) and lead oxide (Pb_3O_4). Standard solutions were also prepared by diluting down an atomic absorption standard solution for lead (1000 ppm).

TABLE 2-4

CYANIDE DETERMINATION - DR-EL/4 MANUAL, PAGE 2-89

Cyanide-ion	Standard strength (ppm CN^- equivalent)	Test value (ppm CN^- equivalent)
Sodium cyanide, NaCN	0.05	0.050
	0.10	0.102
	0.20	0.185
	0.30	0.290

Available Range: 0 - 0.3 ppm cyanide as CN^-

The test results are shown in Table 2-5.

The lead oxide (Pb_3O_4) standard showed no response, due to poor solubility in the buffered water sample. The lead oxide (PbO) and lead chromate standards showed results agreeing reasonably well with the expected values, although there was a distinct tendency to err on the high side. The solutions obtained by dilution of the atomic absorbtion lead standard solution showed results in very good agreement with the prepared values.

Conclusions

1. The HACH method for the determination of lead in water samples provides satisfactory results for samples containing soluble lead salts.
2. Adequate supplies of expendable reagents and solutions should be maintained at home-base.

2.2.2.6 Phenols in waters

This test, DR-EL/4 Manual, page 2-205, is intended to determine phenols and substituted phenols in water and waste water samples. The addition of 4-aminoantipyrine to a buffered water sample results in the development of a yellow or amber colour in the presence of phenols. Ferrocyanide ion must be present. A blank solution is required.

The intensity of the yellow/amber colour is measured at 460 nm, using the Phenol (4-Aminoanti Pyrine Method) Meter Scale. The meter readout gives directly the ppm of phenol as C_6H_5OH.

TABLE 2-5

LEAD DETERMINATION - DR-EL/4 MANUAL, PAGE 2-126

Lead salt	Standard strength (ppb Pb equivalent)	Test value (ppb Pb equivalent)
Lead chromate, $PbCrO_4$	0.0	0.0
	35	42
	69	76
	105	112
Lead oxide,	0.0	0.0
	50	57.5
	100	108.8
	150	155.5
AA lead standard, dilutions	0.0	0.0
	25	23.5
	50	47.0
	100	96.5
	150	142.8

Available Range: 0 - 150 ppb lead

A set of water standards containing phenol was prepared. The test results are shown in Table 2-6.

These results show excellent agreement with the prepared values.

Conclusions

1. The HACH technique for the determination of phenols in water samples showed satisfactory results. Only phenol alone was tested in the study.
2. Adequate supplies of all expendable reagents and solutions should be maintained at home-base.

2.2.3 Additional methods available from the HACH DR-EL/4 kit

The Laboratory Manual (3) provides information on the setups and operations required for additional hazardous substances determinations in water and waste water samples. These have not been described in this Report, since they are not among the hazardous substances covered by the mandate. The substances are listed below, together with the available range factors.

Hazardous material	Available range factor
Bromine	0 - 125 ppm
Carbon dioxide	0 - 100 ppm
Chromium, hexavalent	0 - 0.5 ppm
Hardness, total	0 - 7 ppm
Iodine	0 - 150 ppb
Manganese	0 - 10 ppm
Nitrogen, nitrite	0 - 0.2 ppm
Oxygen, dissolved	0 - 20 ppm
Silica	0 - 2 ppm

TABLE 2-6

PHENOL DETERMINATION - DR-EL/4 MANUAL, PAGE 2-205

Phenols	Standard strength (ppm phenol equivalent)	Test value (ppm phenol equivalent)
Phenol, C_6H_5OH	0.0	0.0
	0.05	0.047
	0.10	0.098
	0.20	0.188

Available Range: 0 - 0.2 ppm as phenol (C_6H_5OH)

2.3 Modified Analytical Techniques for Soil/Sediment and Solid Spilled Material Samples

2.3.1 General

The HACH DR-EL/4 kit methods concentrate mainly on the determination of hazardous materials as contaminants of water media. This implies that the applicable hazardous substances have some significant degree of solubility in water. A number of hazardous materials covered by the mandate display poor solubility, so that quantification in soil/sediment or spill material samples is of importance.

A series of techniques was developed during the Contract period to cover such contingencies. While these methods are not HACH techniques, the reagents/apparatus required could be conceviently incorporated with certain equipment units avaiable in the DR-EL/4 kit. The solutions required for these methods, and many of the reagents, are generally foreign to the HACH kit, and must be prepared and standardized (solutions) or available (solids) as additions. None of these methods are original; they merely represent adaptations of common titrimetric analytical procedures.

A laboratory manual (4) has been prepared and submitted in these connections. The following provides a basic picture of the methodologies involved. Experimental titrations were not carried out, since the methods are standard and of proven worth.

2.3.2 Analytical techniques

2.3.2.1 Calcium hydroxide, calcium oxide, calcium carbonate in soil/sediment and spill material samples

The analytical technique makes use of the HACH DR-EL/4 Digital Titrator and the 0.749M EDTA Digital Titrator Cartridge and accessories. In addition, the HACH Cal Ver 2 indicator powder in used. The titration is of the standard EDTA-calcium form in a solution buffered to pH 10. The presence of magnesium ion is required to ensure that the Eriochrome Black T indicator provides a sharp endpoint colour change.

If the three analytes are all present in the sample under analysis, all will contribute to the titration reaction. The method is therefore best applied under circumstances where the spilled material is known to comprise only one of the analytes. The available range, for each of the analytes and for the respective sample weights involved, is 0 - 100 percent.

2.3.2.2 Calcium hypochlorite in soil/sediment and spilled material

The method is of the iodometric titration form. The addition of potassium iodide to an acetic acid solution of the sample results in the release of iodine in the presence of calcium hypochlorite. The released iodine is titrated with standard sodium thiosulphate solution, using a soluble starch solution addition as the indicator.

The assumption is that no other iodine-releasing substances will be present in the sample taken, in order to ensure that calcium hypochlorite is reported properly. The available range, for the sample weight suggested, is 0 - 100 percent calcium hypochlorite.

2.3.2.3 Formaldehyde in soil/sediment and spilled material

The method of analysis provides for reaction with most aldehydes and some ketones. It is best, therefore, for a proper estimation of formaldehyde content, that formaldehyde be known to be the only compound contaminating the sample.

The method is based on the addition of a fixed volume of standard lauryl amine solution to form the Schiff base. The excess of lauryl amine is then determined by potentiometric titration involving a standard solution of slicylic acid. The available range for the sample weight suggested is 0 - 100 percent formaldehyde.

2.3.2.4 Hydrogen peroxide in soil/sediment and spilled material

The method of analysis provides for the use of the iodometric titration form. Iodine is released by the addition of potassium iodide in the presence of hydrogen peroxide, the sample solution having been previously acidulated. The released iodine is titrated with a standard solution of sodium thiosulphate, using soluble starch solution as the indicator.

In common with the other titrimetric methods described in this Section, it is important for accurate reporting that other iodine-releasing contaminants be absent. The available range for the sample size indicated is 0 - 1000 ppm hydrogen peroxide.

2.3.2.5 Lead chromate in soil/sediment or spilled material

Again, an iodometric titration form is employed, iodine being released by the action of potassium iodide added to the acidulated sample solution containing lead chromate. The active group relative to the contaminant is the CrO_4^{2-} ion.

The liberated iodine is titrated with standard sodium thiosulphate solution, using soluble starch solution as the indicator. Other substances permitting iodine release should be absent. The available range for the sample weight taken is 0 - 100 percent lead chromate.

2.3.2.6 Lead oxides in soil/sediment or spilled material

In essence, this technique determines the content of litharge (PbO), lead dioxide (PbO_2) or red lead oxide (Pb_3O_4) in the solid sample taken. Note that, for proper reporting, only one of the three oxide forms should be present.

The technique is titimetric, and involves the titration of released lead ion in a pH-controlled solution, with standard magnesium molybdate solution. The adsorption indicator is Solochrome Red B. The available range, for the suggested sample weight, is 0 - 100 percent oxide, regardless of the lead oxide involved.

2.3.2.7 Sodium arsenite in soil/sediment or spilled material

The technique is iodimetric, and involves the titration of a buffered solution of the sodium arsenite-contaminated sample with a standard solution of iodine. Soluble starch is used as the indicator.

It is important, for the accurate reporting of the sodium arsenite content, that other substances capable of reacting similarly with iodine, (e.g. As(III), SO_2, SO_3^{2-}, hydrazine, etc.) be absent. The available range for the sample weight suggested is 0 - 100 percent sodium arsenite.

2.3.2.8 Sodium chlorate in soil/sediment or spilled material

The analytical technique depends on the reduction of sodium chlorate in a strong acid solution with ferrous sulphate. The sodium chlorate is quantitatively transformed to sodium chloride.

The released sodium chloride is titrated with standard silver nitrate solution, after solution pH adjustment to 5 approximately. Diclorfluorscein is used as the adsorption indicator.

Other compounds capable of providing chloride, bromide or iodide ions to the solution must be absent. The available range for the sample weight involved is 0 - 100 percent sodium chlorate.

2.3.2.9 Zinc oxide in soil/sediment or spilled material

The method involves an EDTA solution titration of a buffered (10 pH) solution of the contaminated sample. Eriochrome Black T is used as the indicator.

The method is a simplified one. It depends for its accuracy of reporting on the absence of Pb, Cd, Ni, Co, Fe, Mn and Hg. The available range for the sample weight suggested is 0 - 100 percent zinc oxide.

2.3.3 General conclusions relative to the HACH DR-EL/4 kit tests of a standard nature

Section 2.2.4 of reference (2) gave a general outline of:-

1. Limitations as to media of application
2. Limitations as to application
3. Limitations as to methodologies
4. General applicability

Since no further conclusions were forthcoming out of the 1982-83 work, it would be redundant to repeat this material here.

2.4 OVA Investigations - Level II Methods

2.4.1 General

The technique is basically one involving the examination of air samples taken at spill sites. Under specific circumstances, the method can be applied to yield results from water or soil/sediment samples, head-spacing techniques being used in such instances.

A rather complete description of the principles of the OVA in the "sniffer" mode, as well as of the physical characteristics of the unit, is given in the OVA Field Manual prepared for this Contract (5). Only specific significant points will be covered in this section.

Since the hydrogen flame ionization detector (FID) unit varies in response, and in the sensitivity of response, from one applicable organic vapour to another, the instrument requires calibration for each substance. The basic calibration of the unit in the "sniffer" mode involves the use of methane gas standards.

The calibration procedure for each of the applicable organic vapours is carried out through the use of a set of standards covering the concentration range of interest. Although the OVA manufacturer recommends the one-time use of green plastic garbage bags for this purpose, these were found to be unsatisfactory (see reference (2), Section 2.3.3). The use, for calibration purposes, of 44 liter aluminized polyester (Mylar) sample bags is essential in order to avoid reaction/absorption problems with many of the organic vapours involved.

In general, the volume of pure organic liquid/vapour necessary to yield a calibration standard of known ppm (v/v) in a given volume of the air mixture is given by:-

$$\text{Volume (ul)} = \frac{\text{ppm x MW x bag volume (liters)}}{\text{density (g/ml) x ml/mole}} \qquad (1)$$

The calculated volume of the pure organic substance is injected into the sample bag, using a good-quality microliter syringe, while the bag is being filled with air. When filled to capacity, the filling port is closed and the contents allowed to stand for 5 minutes to permit evaporation of the organic liquid. Agitation of the bag periodically during this period helps to ensure homogeneity.

Each calibration standard of a series is tested once, and the test procedure is repeated after a 30 minute interval to indicate lack of significant amplifier drift and to ensure complete equilibration. If the two sets of tests do not agree within experimental error, a third set of measurements is carried out. Two sets of replicates showing good agreement are required and, when these have been obtained, the average meter reading is plotted against the sample concentration in ppm. The least squares equation is then calculated. It is not necessary to draw the least squares line, as the equation can be applied in field work. The calculated regression coefficient will provide a measure of the "goodness of fit" of the experimental data to the regression line. A point in the regression line or equation is applied to calculate the relative response of the test substance to methane, using the expression:-

$$\text{Relative response to methane (\%)} = \frac{\text{meter reading (ppm)} \times 100}{\text{sample concentration (ppm)}} \qquad (2)$$

It is important to note that the relative response factors determined in this study for one instrument can not be applied to another instrument. Nor can the relative response factor for a given instrument be applied after modification or repair of the instrument. This situation becomes more and more significant as the response factors show lower and lower values. The entire picture is discussed in (5), pages B-2 to B-5. For this reason, the experimental data for the OVA studies always carries the identification of the OVA instrument used by number (e.g. OVA 1, OVA 2, etc.), and an indication of the relationship between these numbers and the corresponding instrument serial number is given in the appendix covering such experimental data.

In usage in the field, the OVA would normally be applied in the "sniffer" mode, and a continuous sampling of the suspect air would be carried out. The meter reading would then provide the ppm value for the contaminant present.

It should be noted that, in the "sniffer" mode, all FID-sensitive vapours present in the air sample will be measured simultaneously. If two or more such organic substances are present, the OVA will give a single response proportional to the total concentration of the vapours present and based on their respective response factors. If it is necessary to separate and quantify the individual components in such a mixture, the OVA should be used in the "GC" mode. In this mode of operation, the air sample is injected to the GC column, the components are then eluted separately from the column, passed to the FID chamber and the individual responses reported as peaks on a recorder. Qualitative identification can be obtained from the individual retention times, while quantification can be obtained by triangulation measurement of the individual peak areas. Comparison with data for known standards is required.

2.4.2 OVA testing and calibration of organic vapour standards in the "sniffer" mode - Test results

Appendix C lists the calibration test results for the experimental program conducted. Two or three series of tests were carried out on separately prepared standards. Each set of standards was tested at equilibration and 30 minutes later. Testing was continued, when required, until equilibration data was obtained.

Only the linear regression equation for X-power = 1 was determined. No attempt was made to investigate the "goodness of fit" of the data for regressions involving higher powers of X.

2.4.3 Conclusions from the OVA "sniffer mode" test results

Forty-three (43) of the hazardous organic liquid/vapour substances tested showed viable results.

In most cases, the upper limit value shown for the working range is indicative of the limit of the linear relationship between concentration and Meter Reading Corrected data. In some instances, extension of the indicated upper limit within the linear relationship might be possible.

The lower limit values, which are shown in Appendix C for each substance as part of the working range, may not always be accurately obtained since, in certain instances, the sensitivity of the instrument is less reliable when operating at lower detection levels. In the majority of cases, the lower limits found for the various substances were equal to or better than the lower limit requirements of NIOSH/OSHA and/or ACGIH.

The OVA No. 2 unit showed an almost consistent tendency to provide appreciably lower response factors than the other four instruments tested, so that sensitivity will be poorer when using this unit. Indications were that this situation may be due to inherent amplifier and/or detector problems.

A comparison of the working range values obtained for the organic substances tested successfully, versus the NIOSH/OSHA and ACGIH requirements is provided in Appendix B.

It was concluded that the OVA "sniffer mode" system is capable of providing for good field testing for spills involving air contaminated by the hazardous organic materials which showed satisfactory responses.

2.4.4 The OVA "GC" mode

The use of the techniques of standard GC testing is required under circumstances involving:-

a) Air samples contaminated by more than one active hazardous organic material, requiring separation and individual quantification.

b) Headspace testing of samples of soils/sediments or water contaminated by one or more than one active hazardous organic material.

No testing was carried out with the OVA unit(s) in the "GC mode" relative to the conditions indicated in the foregoing. There were two main reasons for this, and these are outlined below.

1. Carrying out tests on arbitrarily contrived mixtures of the sensitive hazardous organic substances of interest would be an extremely time-consuming procedure and, in the last analysis, would provide a mass of data on systems with probably a low incidence of actual occurrence.
2. It was, and is, the feeling of the investigators that, without detracting from the ability of the OVA to function in the "GC mode", tests involving multi-component mixtures, or headspacing methods, would be best carried out through the application of a full-scale, laboratory-style GC unit.

2.5 HNU Investigations - Level II Methods

2.5.1 General

The technique of analysis involving the PI-101 unit covers the measurement of applicable trace gases/vapours in the atmosphere. It is therefore a means of quantifying actual contaminating vapour substances in air samples taken at spill sites. The HNU unit can not normally be easily applied in the analysis of contaminated water or soil-sediment samples.

A complete description of the instrument and its principle of operation is given in the HNU Field Manual prepared for this Contract (6). Only the more significant specific points will be covered in this section.

The unit functions on the photoionization principle, using ultraviolet light from a source lamp for photon emission. The energy of the emitted photons is high enough to ionize many trace species, particularly organic trace species, in the air sample, but is low enough to avoid ionizing the major components of the atmosphere (e.g. N_2, O_2, CO_2, H_2O).

The ions formed are attracted to a suitably charged collector electrode, and the current generated is proportional, within limits, to the concentration of the ionizable substance. It is apparent that, if more than one ionizable substance is present in the contaminated air sample under investigation, the current generated will reflect the total of the substances present in one way or another. Since the HNU unit can not be operated in a mode capable of discriminating between different components present, it should be used where the nature of the sample is such that it contains a single contaminant.

The response factor varies from one active substance to another, so that the HNU unit must be calibrated for each active substance. The basic instrumental calibration is against a set of benzene standards.

The calibration procedure and the preparation of the required sets of standards for each substance to be investigated is outlined in Section 2.4.1, General, and in the HNU Field Manual (6) pages A8-A10. The relative response factor is found from:-

$$\text{Relative response to benzene (\%)} = \frac{\text{meter reading (ppm) x 100}}{\text{sample concentration (ppm)}} \qquad (3)$$

2.5.2 HNU testing and calibration of organic vapour standards

Appendix D lists the calibration test results for the experimental carried out. Test series were involved for each substance of interest in the mandate list. All four of the available HNU units were used in each set of tests. Each test required that a run be made at equilibration of the prepared standard, with a second run 30 minutes later.

Only the linear regression equation was prepared from each set of test results, and this invariably involved only X-power = 1. No attempt was made, except on a curiosity basis, to investigate the "goodness of fit" of the data for regressions involving higher powers of X.

It is important to note that many of the linear equations and response factors shown for the substances tested and reported in Appendix D may differ more or less from the information shown in the HNU Field Manual (6), pages B1-B66. The Appendix D data should be taken as valid in all cases, since they were obtained from a more detailed analysis of the sets of test results.

2.5.3 Conclusions from the HNU test results

Thirty-one (31) of the hazardous organic liquid/vapour substances tested showed viable data.

In most instances, the response factors for the HNU units were significantly lower than those obtained during the OVA tests in the "sniffer mode". By this is meant that the magnitude of the meter readings, for comparable concentrations of each substance, most frequently were much lower than those for the OVA units. This, of course, implies a lower order of sensitivity for the HNU unit.

Quite frequently the second test on the same sample showed a significantly lower reading than that obtained for the first test. This found to be due, in large part, to fouling of the lamo surface. It was found to be best to wipe the surface off with lens tissue prior to each set of readings.

In most instances, the upper limit of the working range shown in Appendix D for each substance represents the limit of the linear relationship between concentration and meter reading. In a few cases, extension of the upper limit within the linear relationship might be possible.

The lower limit values for the working ranges may not always be attained, since the instrument, in certain instances, shows a tendency to reduced sensitivity and erratic readings when operating at low detection levels. For most of the substances tested, the lower limits found were equal to or better than the lower limits requirements of NIOSH/OSHA and/or ACGIH. A comparison of the working range values obtained in these tests versus the NIOSH/OSHA and ACGIH requirements is provided in Appendix B.

It was concluded that the HNU is a simple and relatively satisfactory device for the field testing of contaminated air samples at spill sites, provided that the contaminant is suitably active and also that only one active contaminant is to be quantified. Relatively low meter readings per concentration unit will, in the cases of certain hazardous substances, lead to lower orders of precision, sensitivity and accuracy.

2.6 Applications Data for Level I and Level II Systems

Appendix B provides a summary of the applications for Levels I and II systems. Comparisons with the NIOSH/OSHA and ACGIH requirements are included under each system heading. The following outline gives a picture of

Appendix B details.

1. Drager tubes - testing of contaminated air samples.
2. HACH DR-EL/4 lit - testing of water samples and leach samples from contaminated soil/sediment. Modified HACH tests - testing of contaminated soil/sediment samples or samples of spilled materials.
3. OVA - testing of contaminated air samples.
4. HNU - testing of contaminated air samples.

3. EXPERIMENTAL RESULTS FOR LEVEL III SYSTEMS

3.1 General

This Report represents PART 1 of the final report. It covers the testing associated with Level I and II systems. Level III systems, involving linked UV/IR/TRS80 units will be reported on by the remaining Principal Investigator as Part II.

It will be noted that, for the moment, Appendix B lists an indication of the hazardous materials to be detected by Level III techniques. The substances not covered by Level I and II systems are included here and, in addition, check-testing can be carried out for many of the substances covered by the Level I and II systems.

REFERENCES

1. "The Design of an Analytical System for the Detection and Monitoring of a Number of Hazardous Materials", Dick, J.G., R.T. Rye and R.H. Verschingel. Report to the EEB, April, 1981

2. "Design of an Analytical System for Quantitative Measurement of Hazardous Substances in Air, Water and Sediments; Calibration of the HNU Photoanalyzer for Detecting Hazardous Substances", Dick, J.G., R.T. Rye and R.H. Verschingel. Report to the EEB, July, 1982

3. "Laboratory Manual for the Setup and Operation of the HACH DR-EL/4 Kit for the Detection of Applicable Hazardous Substances at Spill Sites", Chester, L., R.T. Rye and J.G. Dick. Report to the EEB, February, 1983

4. "Laboratory Manual for the Setup and Operation of New and Modified HACH DR-EL/4 Kit-Based Methods for the Detection of Applicable Hazardous Substances at Spill Sites. Appendix I", J.G. Dick. Report to the EEB, April, 1983

5. "OVA Field Manual", Chester, L., and R.T. Rye. Report to the EEB, March, 1983

6. "HNU Field Manual", Chester, L., and R.T. Rye. Report to the EEB, March, 1983

APPENDIX A

LISTS OF PRIORITY HAZARDOUS MATERIALS FROM THE ENVIRONMENTAL EMERGENCY BRANCH

LIST OF PRIORITY HAZARDOUS MATERIALS FROM THE ENVIRONMENTAL EMERGENCY BRANCH

Group A

The Highest Priority 50 Chemicals
(In Alphabetical Order)

Acetic Acid

Acetic Anhydride

Ammonia

Ammonium Nitrate

Ammonium Phosphates

Benzene

Butyraldehydes

Calcium Chloride

Calcium Hydroxide/Oxide

Carbon Dioxide

Chlorine

Cyclohexane

Ethylbenzene

2-Ethylhexanol

Ethylene

Ethylene Dichloride (1,2-Dichlorethane

Ethylene Glycol

Ethylene Oxide

Ferric Chloride

Formaldehyde

Hydrogen Chloride (HCl)

Hydrogen Fluoride

Hydrogen Sulphide

Mercury

Methanol

Morpholine

Naphtha

Natural Gas

Nitric Acid

Phenol

Phosphoric Acid

Phosphorus

Potash (Potassium Chloride)

Propylene

Propylene Oxide

Sodium Chlorate

Sodium Chloride

Sodium Hydroxide

Sodium Hypochlorite

Sodium Sulphate

Styrene (Monomer)

Sulphur

Sulphur Dioxide

Sulphuric Acid

Tetraethyl Lead

Toluene

Urea

Vinyl Chloride

Xylenes

Zinc Sulphate

LIST OF PRIORITY HAZARDOUS MATERIALS FROM THE ENVIRONMENTAL EMERGENCY BRANCH

Group B

The Second Group of 100 Priority Chemicals

(In Alphabetical Order)

Acetone

Acetylene

Acrylonitrile

Adipic Acid

Aluminum Chloride

Aluminum Hydroxide

Aluminum Sulphate

Aminocarb (Matacil)

Ammonium Chloride

Ammonium Sulphate

Arsine

Barium Sulphate

Benzoic Acid

Borax

Boric Acid

1,3-Butadiene

Butanols

Butylene

Calcium Carbide

Calcium Carbonate

Calcium Hypochlorite

Calcium Phosphate

Caprolactam

Carbaryl

Carbofurans

Carbon Disulphide

Carbon Tetrachloride

Chlordane

Chloroform

Copper Sulphate

Cresols

Cumene

Dicamba

Dichlorobenzene

2,4-D (2,4-Dichlorophenoxyacetic Acid)

Dimethyl Ether

Dimethyl Terephthalate

Dinoseb

Diphenylmathane-4,4'-Diisocyanate

Ethanolamine

Ethanol
Ethylene Dibromide
Fenitrothion
Fluorochloromethanes
Formic Acid
n-Hexane
Hydrazine
Hydrogen
Hydrogen Peroxide
Isopropanol
Isopropylbenzene
Latex
Lead Chromate
Lead Oxides
Magnesium Hydroxide/Oxide
Malathion
Maleic Anhydride
MCPA
Methane
Methyl Ethyl Ketone
Methyl Isobutyl Ketone
Methyl Methacrylate
Methylamine
Methylene Chloride
Nitrilotriacetic Acid

Nitroglycerine
Nonyl Phenol
Pentachlorophenol
Pentaerythritol
Perchloroethylene
Phthalic Anhydride
Potassium Hydroxide
Potassium Sulphate
Propylene Glycols
Sodium Aluminate
Sodium Arsenite
Sodium Borohydride
Sodium Carbonate
Sodium Cyanide
Sodium Dichloroisocyanura
Sodium Dichromate
Sodium Hydrosulphite
Sodium Phosphates
Sodium Silicates
Sodium Sulphite
Tall Oil
Terephthalic Acid
Terphenyls
Tetramethyl Lead
Titanium Dioxide

2,4-Toluene Diisocyanate

Triallates

1,1,1-Trichlorethane

Trifluralins

Trinitrotoluene

Turpentine

Vinyl Acetate

Yellow Cake

Zinc Chloride

Zinc Oxide

APPENDIX B

HAZARDOUS SUBSTANCES LIST WITH APPROPRIATE FIELD TESTING UNITS DETECTION LIMITS - NIOSH/OSHA AND ACGIH LIMITS

The following should be noted

NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
ACGIH	American Conference of Governmental Industrial Hygienists
PEL	Permissible Exposure Limit
IDLH	Immediately Dangerous to Life or Health
TWA	Time-weighted Average (Threshold Limit Value)
STEL	Short Term Exposure Limit (Threshold Limit Value)

DRAGER TUBES - Testing of Contaminated Air Samples

Substance	DRAGER tube(s) ppm range	NIOSH/OSHA PEL ppm	NIOSH/OSHA PEL mg/m^3	NIOSH/OSHA IDLH ppm	NIOSH/OSHA IDLH mg/m^3	ACGIH TWA ppm	ACGIH TWA mg/m^3	ACGIH STEL ppm	ACGIH STEL mg/m^3
Acetic acid	5-80	10	25	1000	-	10	25	15	37
Acetic anhydride	20-320	5	20	1000	-	5	20	-	-
Acetone	100-12000	1000	2400	20000	-	1000	2400	1250	3000
Acetylene	-		asphyxiant				asphyxiant		
Acrylonitrile	0.5-30	2	-	4000	-	2	-	-	-
Adipic acid	-	-	-	-	-	-	-	-	-
Alum. chloride	-	-	-	-	-	-	2	-	-
Alum. hydroxide	-	-	-	-	-	-	10	-	-
Alum. sulphate	-	-	-	-	-	-	2	-	-
Aminocarb(Matacil)	-	-	-	-	-	-	-	-	-
Ammonia	5-700	50	35	500	-	25	18	35	27
Amm. chloride	-	-	-	-	-	-	10	-	-
Amm. nitrate	-	-	-	-	-	-	-	-	-
Amm. phosphates	-	-	-	-	-	-	-	-	-
Amm. sulphate	-	-	-	-	-	-	-	-	-
Arsine	0.05-3	0.05	0.2	6	-	0.05	0.2	-	-
Barium sulphate	-	-	0.5	-	250	-	0.5	-	-
Benzene	0.5-420	1	-	2000	-	10	30	25	75
Benzoic acid	-	-	-	-	-	-	-	-	-
Borax	-	-	-	-	-	-	1	-	-
Boric acid	-	-	-	-	-	-	1	-	-
1,3-Butadiene	-	1000	2200	20000	-	1000	2200	1250	2750
Butanol	-	100	300	8000	-	50	150	-	-
Butylene	-	-	-	-	-	-	-	-	-
Butyraldehydes	-	-	-	-	-	-	-	-	-
Calcium carbide		acetylene generation in contact with water							
Calcium carbonate	-	-	-	-	-	-	dust-10	-	-
Calcium chloride	-	-	-	-	-	-	-	-	-
Cal. hydroxide/oxide	-	-	5	-	250	-	2	-	-
Cal. hypochlorite	-	-	-	-	-	-	-	-	-
Calcium phosphate	-	-	-	-	-	-	-	-	-

Substance	DRAGER tube(s) ppm range	NIOSH/OSHA				ACGIH			
		PEL		IDLH		TWA		STEL	
		ppm	mg/m3	ppm	mg/m3	ppm	mg/m3	ppm	mg/m3
Caprolactam	-	-	-	-	-	5	20	10	40
Carbaryl	-	-	5	-	625	-	5	-	40
Carbon dioxide	0.01-60% v/v	5000	-	50000	-	5000	9000	15000	27000
Carbon disulphide	5-3200	20	-	500	-	10	30	-	-
Carbon tetrachloride	5-50	10	-	300	-	5	30	20	125
Carbofurans	-	-	-	-	-	-	0.1	-	-
Chlordane	-	-	0.5	-	500	-	0.5	-	2
Chlorine	0.2-500	1	3	25	-	1	3	3	9
Chloroform	-	50	240	1000	-	10	50	50	225
Cu sulphate	-	-	1	-	-	-	fume 0.2	-	-
Cresols	-	5	22	250	-	5	22	-	-
Cumene	-	50	245	8000	-	50	245	75	365
Cyclohexane	0.2-500	300	1050	10000	-	300	1050	375	1300
Dicamba	-	-	-	-	-	-	-	-	-
Dichlorobenzene	-	50	300	1700	-	50	300	110	675
2,4-Dichlorophenoxyacetic acid (2,4-D)	-	-	10	--	500	-	10	-	20
Dimethyl ether	-	-	-	-	-	-	-	-	-
Dimethyl terephthalate	-	-	-	-	-	-	-	-	-
Dinoseb	-	-	-	-	-	-	-	-	-
Diphenylmethane-4,4'-diisocyanate	-	0.02	0.2	10	-	0.02	0.2	-	-
Ethanol	100-3000	-	-	-	-	1000	1900	-	-
Ethanolamine	-	3	6	1000	-	3	8	6	15
Ethyl benzene	30-400	100	435	2000	-	100	435	125	545
Ethylene	0.5-2500			asphyxiant			asphyxiant		

Substance	DRAGER tube(s) ppm range	NIOSH/OSHA				ACGIH			
		PEL		IDLH		TWA		STEL	
		ppm	mg/m3	ppm	mg/m3	ppm	mg/m3	ppm	mg/m3
Ethylene dibromide	-	20	1	400	-		carcinogen		
Ethylene dichloride	-	5	15	1000	-	10	40	15	10
Ethylene glycol	-	-	-	-	-	50	125	-	-
Ethylene oxide	25-500	50	90	800	-	10	20		
2-Ethylhexanol	-	-	-	-	-	-	-	-	-
Fenitrothion	-	-	-	-	-	-	-	-	-
Ferric chloride	-	-	10	-	-	-	-	-	-
Fluorochloro-methanes	-	1000	4200	50000	-	1000	3500	1250	4375
Formaldehyde	0.5-40	3	-	100	-	2	3	-	-
Formic acid	1-15	5	9	100	-	5	9	-	-
n-Hexane	100-3000	500	1800	5000	-	100	360	125	450
Hydrazine	0.25-3	1	1.3	80	-	0.1	0.1	-	-
Hydrogen	0.5-3% v/v		asphyxiant				asphyxiant		
Hydrogen chloride (HCl)	1-5000	5	7	100	-	5	7	-	-
Hydrogen fluoride (HF)	1.5-15	3	2	20	-	3	2.5	-	-
Hydrogen peroxide	-	1	1.4	75	-	1	1.5	2	3
Hydrogen sulphide	0.5-2000	20	-	30	-	10	14	15	21
Isopropanol	-	400	980	20000	-	400	980	500	1225
Isopropyl-benzene	-	-	-	-	-	-	-	-	-

Substance	DRAGER tube(s) ppm range	NIOSH/OSHA				ACGIH			
		PEL		IDLH		TWA		STEL	
		ppm	mg/m3	ppm	mg/m3	ppm	mg/m3	ppm	mg/m3
Latex	-	-	-	-	-	-	-	-	-
Lead chromate	-	-	-	-	-	0.05	-	-	-
Lead oxides	-	-	0.05	-	-	-	fume 0.15	-	0.45
Mg hydroxide	-	- fume	15	-	-	-	fume 10	-	-
Malathion	-	-	15	-	5000	-	10	-	-
Maleic anhydride	-	0.25	1	-	-	0.25	1	-	-
MCPA	-	-	-	-	-	-	-	-	-
Mercury	0.1-2 mg/m^3	-	0.1	-	28	-	0.05	-	0.15
Methane	-		asphyxiant				asphyxiant		
Methanol	100-3000	200	260	25000	-	200	260	250	310
Methylamine	-	10	12	100	-	10	12	-	-
Methyl ethyl ketone	-	200	590	3000	-	200	590	300	885
Methyl isobutyl ketone	-	100	410	3000	-	50	205	75	300
Methyl methacrylate	50-500	100	410	4000	-	100	410	125	510
Methylene chloride	100-3000	500	-	5000	-	100	360	500	1700
Morpholine	-	20	70	8000	-	20	70	30	105
Naphtha	-	500	2000	10000	-	100	575	125	720
Natural gas	5	-	-	-	-	-	-	-	-
Nitric acid	1-50	2	5	100	-	2	5	4	10
Nitrilotriacetic	-	-	-	-	-	-	-	-	-
Nitroglycerine	-	-	-	-	-	0.02	0.2	0.05	0.5
Nonyl phenol	-	-	-	-	-	-	-	-	-
Pentachloro-phenol	-	-	0.5	-	150	-	0.5	-	150
Pentaerythritol	-	-	-	-	-	-	10	-	20
Perchloroethylene	5-500	100	-	500	-	100	670	150	1000
Phenol	5	5	19	100	-	5	19	10	38
Phosphoric acid	-	-	1	-	-	-	1	-	3
Phosphorus	-	-	1	-	-	-	0.1	-	0.3

Substance	DRAGER tube(s) ppm range	NIOSH/OSHA PEL ppm	NIOSH/OSHA PEL mg/m3	NIOSH/OSHA IDLH ppm	NIOSH/OSHA IDLH mg/m3	ACGIH TWA ppm	ACGIH TWA mg/m3	ACGIH STEL ppm	ACGIH STEL mg/m3
Phthalic anhydride	-	2	12	10000	-	1	6	-	24
K chloride	-	-	-	-	-	-	-	-	-
K hydroxide	-	-	-	-	-	-	2	-	-
K sulphate	-	-	-	-	-	-	-	-	-
Propylene	1-55	-	-	-	-		asphyxiant		
Propylene glycol	-	100	600	-	-	100	360	150	500
Propylene oxide	-	100	240	2000	-	20	50	-	-
Na aluminate	-	-	-	-	-	-	-	-	-
Na arsenite	-	-	-	-	-	-	-	-	-
Na borohydride	-	-	-	-	-	-	-	-	-
Na carbonate	-	-	-	-	-	-	-	-	-
Na chlorate	-	-	-	-	-	-	-	-	-
Na chloride	-	-	-	-	-	-	-	-	-
Na cyanide	-	-	5	-	50	-	5	-	-
Na dichloroiso-cyanurate	-	-	-	-	-	-	-	-	-
Na dichromate	-	-	0.1	-	30	-	0.05	-	-
Na hydrosulphite	-	-	-	-	-	-	-	-	-
Na hydroxide	-	-	2	-	200	-	-	-	-
Na hypochlorite	-	-	-	-	-	-	-	-	-
Na phosphates	-	-	-	-	-	-	-	-	-
Na silicates	-	-	-	-	-	-	-	-	-
Na sulphate	-	-	-	-	-	-	-	-	-
Na sulphite	-	-	-	-	-	-	-	-	-
Styrene monomer	10-400	100		5000	-	50	215	100	425
Sulphur	-	-	-	-	-	-	-	-	-
Sulphur dioxide	0.1-500	5	13	100	-	2	5	5	10
Sulphuric acid	-	-	1	-	80	-	1	-	-
Sulphuryl chloride	-	-	-	-	-	-	-	-	-
Tall oil	-	-	-	-	-	-	-	-	-
Terephthalic acid	-	-	-	-	-	-	-	-	-
Terphenyls	-	1	9	-	3500	0.5	5	-	-
Tetraethyl lead	-	-	0.75	-	40	-	0.1	-	0.3

Substance	DRAGER tube(s) ppm range	NIOSH/OSHA PEL ppm	NIOSH/OSHA PEL mg/m3	NIOSH/OSHA IDLH ppm	NIOSH/OSHA IDLH mg/m3	ACGIH TWA ppm	ACGIH TWA mg/m3	ACGIH STEL ppm	ACGIH STEL mg/m3
Titanium dioxide	-	-	15	-	-	-	10	-	-
Toluene	1-1860	200	-	2000	-	100	375	150	560
2,4-Toluene diisocyanate	0.02-0.2	0.02	0.14	10	-	0.02	0.14	-	-
Triallates	-	-	-	-	-	-	-	-	-
1,1,1-Trichloroethane	50-600	350	1900	1000	-	350	1900	450	2450
Trifluralins	-	-	-	-	-	-	-	-	-
Trinitrotoluene	-	-	1.5	-	-	-	0.5	-	-
Turpentine	-	100	560	1900	-	100	560	150	840
Urea	-	-	-	-	-	-	-	-	-
Vinyl acetate	-	-	-	-	-	10	30	20	60
Vinyl chloride	0.5-3000	-	-	-	-	5	10	-	-
Xylenes	25-1860	100	435	10000	-	100	435	150	655
Yellow cake	-	-	0.05	-	20	-	0.2	-	0.6
Zinc chloride	-	- fume	1	-	fume 2000	-	1	-	2
Zinc oxide	-	- fume	5	-	-	- fume	5	- fume	10
Zinc sulphate	-	-	-	-	-	-	-	-	-

HACH DR-EL/4 - Testing of Contaminated Waters and Leaches from Contaminated Soil/Sediment Samples

MODIFIED HACH - Testing of Contaminated Soil/Sediment and Spilled Material Samples

Substance	HACH DR-EL/4	MODIFIED HACH
Acetic acid	free or total acidity 0-250 ppm as calcium carbonate	
Aluminum chloride	0-0.75 ppm as Al	
Aluminum hydroxide	0-0.75 ppm as Al	
Aluminum sulphate	0-0.75 ppm as Al 0-150 ppm as SO_4	
Ammonia	0-2 ppm as N	
Ammonium chloride	0-125 ppm as Cl	
Ammonium nitrate	0-30 ppm as N	
Ammonium phosphates	0-2 ppm as PO_4	
Ammonium sulphate	0-150 ppm as SO_4	
Borax	0-15 ppm as B	
Boric acid	0-15 ppm as B	
Calcium carbonate	0-1000 ppm as calcium carbonate	
Calcium chloride	0-1000 ppm as calcium chloride: 0-125 ppm as Cl	
Calcium hydroxide/oxide		0-100% of sample taken
Calcium hypochlorite		0-100% of sample taken
Calcium phosphate	0-2 ppm as PO_4	
Chlorine	0-2 ppm as Cl	
Copper sulphate	0-3 ppm as Cu	
Ferric chloride	0-2 ppm as Fe 0-125 ppm as Cl	
Formaldehyde		0-100% of sample taken
Hydrogen chloride	free or total acidity: 0-125 ppm as Cl	
Hydrogen fluoride	free or total acidity: 0-2 ppm as F	
Hydrogen peroxide		0-1000 ppm (water or leach)
Lead chromate		0-100% of sample taken
Lead oxides		0-100% of sample as taken
Nitric acid	free or total acidity: 0-30 ppm as N	
Phosphoric acid	free or total acidity: 0-2 ppm as PO_4	
Potassium chloride	0-125 ppm as Cl	
Potassium hydroxide	free or total alkalinity:	
Potassium sulphate	0-150 ppm as SO_4	

Substance	HACH DR-EL/4	MODIFIED HACH
Sodium arsenite		0-100% sample as taken
Sodium chlorate		0-100% of sample taken
Sodium chloride	0-125 ppm as Cl	
Sodium cyanide	0-0.3 ppm as CN	
Sodium dichromate	0-0.5 ppm as Cr^{6+}	
Sodium hydroxide	free or total alkalinity	
Sodium hypochlorite		0-100% of sample taken
Sodium phosphates	0-2 ppm as PO_4	
Sodium silicates	0-2 ppm as SiO_2	
Sodium sulphate	0-150 ppm as SO_4	
Sulphuric acid	free or total acidity: 0-150 ppm as SO_4	
Zinc chloride	0-125 ppm as Cl	
Zinc oxide		0-100% of sample as taken
Zinc sulphate	0-150 ppm as SO_4	

OVA - Testing of Contaminated Air Samples (Sniffer Mode)

	OVA	NIOSH/OSHA				ACGIH			
	ppm	PEL		IDLH		TWA		STEL	
Substance	range	ppm	mg/m^3	ppm	mg/m^3	ppm	mg/m^3	ppm	mg/m^3
Acetic acid	50-1000	10	25	1000	-	10	25	15	37
Acetic anhydride	50-1000	5	20	1000	-	5	20	-	-
Acetone	100-1500	1000	2400	20000	-	1000	2400	1250	3000
Acrylonitrile	0.5-30	2	-	4000	-	2	-	-	-
Benzene	5-500	1	-	2000	-	10	30	25	75
1,3-Butadiene	150-1000	1000	2200	20000	-	1000	2200	1250	2750
Butanol	10-500	100	300	8000	-	50	150	-	-
Butylene	50-1000	-	-	-	-	-	-	-	-
Butyraldehydes	10-1000	-	-	-	-	-	-	-	-
Carbon tetrachloride	40-3000	10	-	300	-	5	30	20	125
Chloroform	5-1000	50	240	1000	-	10	50	50	225
Cumene	40-1000	50	245	8000	-	50	245	75	365
Cyclohexane	25-600	300	1050	10000	-	300	1050	375	1300
Dichlorobenzene	50-1000	50	300	1700	-	50	300	110	675
Ethanol	50-1850	-	-	-	-	1000	1900	-	-
Ethylbenzene	20-2000	100	435	2000	-	100	435	125	545
Ethylene	10-300		asphyxiant				asphyxiant		
Ethylene dibromide	10-400	20	1	400	-		carcinogen		
Ethylene dichloride	0-20	5	15	1000	-	10	40	15	10
Ethylene oxide	100-800	50	90	800	-	10	20	-	-
2-Ethylhexanol	500-1000	-	-	-	-	-	-	-	-
Fluorochloromethanes	-	1000	4200	50000	-	1000	3500	1250	4375
Formaldehyde	100-1000	3	-	100	-	2	3	-	-

	OVA	NIOSH/OSHA				ACGIH			
		PEL		IDLH		TWA		STEL	
Substance	ppm range	ppm	mg/m^3	ppm	mg/m^3	ppm	mg/m^3	ppm	mg/m^3
Isopropanol	25-500	400	980	20000	-	400	980	500	1225
Methane	0-5000	asphyxiant				asphyxiant			
Methanol	25-500	200	260	25000	-	200	260	250	310
Methyl ethyl ketone	40-400	200	590	3000	-	200	590	300	885
Methyl isobutyl ketone	40-1000	100	410	3000	-	50	205	75	300
Methyl methacrylate	10-200	100	410	4000	-	100	410	125	510
Methylene chloride	0-1000	500	-	5000	-	100	360	500	1700
Morpholine	0-20	20	70	8000	-	20	70	30	105
Naphtha	0-1000	500	2000	10000	-	100	575	125	720
Perchloroethylene	0-200	100	-	500	-	100	670	150	1000
Propylene	25-300	asphyxiant				asphyxiant			
Propylene oxide	0-50	100	240	2000	-	20	50	-	-
Styrene monomer	5-100	100	-	5000	-	50	215	100	425
Tetraethyl lead	0-25	-	0.75	-	40	-	0.1	-	0.3
Tetramethyl lead	0-25	-	0.7	-	40	-	0.15	-	-
Toluene	0-120	200	-	2000	-	100	375	150	560
1,1,1-Trichloroethane	0-1000	350	1900	1000	-	350	1900	450	2450
Turpentine	25-1000	100	560	1900	-	100	560	150	840
Vinyl acetate	20-250	-	-	-	-	10	30	20	60
Xylenes	60-500	100	435	10000	-	100	435	150	655

HNU - Testing of Contaminated Air Samples

	HNU	NIOSH/OSHA				ACGIH			
		PEL		IDLH		TWA		STEL	
Substance	ppm range	ppm	mg/m3	ppm	mg/m3	ppm	mg/m3	ppm	mg/m3
Acetic anhydride	10-1000	5	20	1000	-	5	20	-	-
Acetone	25-750	1000	2400	20000	-	1000	2400	1250	3000
Benzene	2-100	1	-	2000		10	30	25	75
1,3-Butadiene	100-600	1000	2200	20000	-	1000	2200	1250	2750
Butanol	10-50	100	300	8000	-	50	150	-	-
Butylene	0-1000	-	-	-	-	-	-	-	-
Butyraldehydes	10-500	-	-	-	-	-	-	-	-
Carbon disulphide	10-500	20	-	500	-	10	30	-	-
Cumene	10-500	50	245	8000	-	50	245	75	365
Cyclohexane	20-600	300	1050	10000	-	300	1050	375	1300
Dichlorobenzene	50-1000	50	300	1700	-	50	300	110	675
Ethanol	50-1850	-	-	-	-	1000	1900	-	-
Ethylbenzene	25-1000	100	435	2000	-	100	435	125	545
Ethylene dibromide	5-400	20	1	400	-		carcinogen		
Ethylene oxide	8-800	50	90	800	-	10	20	-	-
n-Hexane	5-500	500	1800	5000	-	100	360	125	450
Isopropanol	10-500	400	980	20000	-	400	980	500	1225
Methyl ethyl ketone	10-400	200	590	3000	-	200	590	300	885
Methyl isobutyl ketone	100-1000	100	410	3000	-	50	205	75	300
Methyl methacrylate	5-200	100	410	4000	-	100	410	125	510
Morpholine	2-20	20	70	8000	-	20	70	30	105
Naphtha	5-200	500	2000	10000	-	100	575	125	720
Perchloroethylene	10-500	100	-	500	-	100	670	150	1000
Propylene	10-300	-	-	-	-		asphyxiant		

Substance	HNU ppm range	NIOSH/OSHA PEL ppm	NIOSH/OSHA PEL mg/m³	NIOSH/OSHA IDLH ppm	NIOSH/OSHA IDLH mg/m³	ACGIH TWA ppm	ACGIH TWA mg/m³	ACGIH STEL ppm	ACGIH STEL mg/m³
Tetraethyl lead	0.2-25	-	0.75	-	40	-	0.1	-	-
Tetramethyl lead	0.25-25	-	0.7	-	40	-	0.15	-	-
Toluene	1-120	200	-	2000	-	100	375	150	560
1,1,1-Trichloroethane	10-1000	350	1900	1000	-	350	1900	450	2450
Turpentine	10-500	100	560	1900	-	100	560	150	840
Vinyl acetate	20-250	-	-	-	-	10	30	20	60
Xylenes	10-500	100	435	10000	-	100	435	150	655

HAZARDOUS SUBSTANCES COVERED BY THE UV/IR/TRS 80 COMPUTER-LINKED SYSTEMS

It should be noted that the lists following comprise hazardous substances which may or may not be covered by the DRAGER, HACH, MODIFIED HACH, OVA or HNU systems. In no way do these lists exclude the inclusion of further hazardous substances already covered by these other systems.

IR/TRS 80 SYSTEM

1. As thin films, using IRTRAN 2

Substance	IRF File
Chlordane	1,1,1,1,1,1,1,5 1,1,1,1,1,1,1,6
Carbofuran	1,1,1,1,1,1,1,23 1,1,1,1,1,1,1,24
2,4-D amine	1,1,1,1,1,1,1,13 1,1,1,1,1,1,1,14
2,4-D iso-octyl ester	1,1,1,1,1,1,1,11 1,1,1,1,1,1,1,12
Dicamba	1,1,1,1,1,1,1,21 1,1,1,1,1,1,1,22
Dinoseb	1,1,1,1,1,1,1,3 1,1,1,1,1,1,1,4
Fenitrothion	1,1,1,1,1,1,1,1 1,1,1,1,1,1,1,2
MCPA	1,1,1,1,1,1,1,15 1,1,1,1,1,1,1,16
MCPA iso-octyl ester	1,1,1,1,1,1,1,17 1,1,1,1,1,1,1,18
MCPA amine	1,1,1,1,1,1,1,19 1,1,1,1,1,1,1,20
Trifluralin	1,1,1,1,1,1,1,7 1,1,1,1,1,1,1,8

2. As KBr Discs

Substance	IRF File
Aluminum hydroxide	2,2,2,2,2,2,2,39 2,2,2,2,2,2,2,40
Barium sulphate	2,2,2,2,2,2,2,37 2,2,2,2,2,2,2,38
Calcium hydroxide	2,2,2,2,2,2,2,3 2,2,2,2,2,2,2,4
Calcium oxide	2,2,2,2,2,2,2,1 2,2,2,2,2,2,2,2
Calcium hypochlorite	2,2,2,2,2,2,2,13 2,2,2,2,2,2,2,14
Caprolactam	2,2,2,2,2,2,2,35 2,2,2,2,2,2,2,36
Ethanolamine	2,2,2,2,2,2,2,48 2,2,2,2,2,2,2,49
Ethylene glycol	2,2,2,2,2,2,2,50 2,2,2,2,2,2,2,51
Hydrazine	2,2,2,2,2,2,2,52 2,2,2,2,2,2,2,53
Hydrogen peroxide	2,2,2,2,2,2,2,54 2,2,2,2,2,2,2,55
Latex	2,2,2,2,2,2,2,56 2,2,2,2,2,2,2,57
Lead chromate	2,2,2,2,2,2,2,34
Lead oxide (red)	2,2,2,2,2,2,2,32
Lead oxide (yellow)	2,2,2,2,2,2,2,33
Magnesium hydroxide	2,2,2,2,2,2,2,45
Maleic anhydride	2,2,2,2,2,2,2,20 2,2,2,2,2,2,2,21
Nitrilotriacetic acid	2,2,2,2,2,2,2,30 2,2,2,2,2,2,2,31
Pentaerythritol	2,2,2,2,2,2,2,18 2,2,2,2,2,2,2,19
Phthalic anhydride	2,2,2,2,2,2,2,5 2,2,2,2,2,2,2,6
Potassium carbonate	2,2,2,2,2,2,2,43 2,2,2,2,2,2,2,44
Propylene glycol	2,2,2,2,2,2,2,46 2,2,2,2,2,2,2,47

Substance	IRF File
Sodium arsenite	2,2,2,2,2,2,2,7
Sodium hydrosulphite	2,2,2,2,2,2,2,28 2,2,2,2,2,2,2,29
Sodium sulphate	2,2,2,2,2,2,2,41 2,2,2,2,2,2,2,42
Terephenyls	2,2,2,2,2,2,2,16 2,2,2,2,2,2,2,17
Terephthalic acid	2,2,2,2,2,2,2,10 2,2,2,2,2,2,2,11
Titanium dioxide	2,2,2,2,2,2,2,15
Yellow cake (Beaver Lodge)	2,2,2,2,2,2,2,26 2,2,2,2,2,2,2,27
(Denison)	2,2,2,2,2,2,2,24 2,2,2,2,2,2,2,25
(Matawaska)	2,2,2,2,2,2,2,22 2,2,2,2,2,2,2,23

UV/TRS 80 SYSTEM	UV File
Cresol	1,1,1,1,1,1,1,1 1,1,1,1,1,1,1,2 1,1,1,1,1,1,1,3 1,1,1,1,1,1,1,4 1,1,1,1,1,1,1,5
Dimethyl Terephthalate	0,0,0,0,0,0,0,16 0,0,0,0,0,0,0,17 0,0,0,0,0,0,0,18 0,0,0,0,0,0,0,19
Formaldehyde	0,0,0,0,0,0,0,9
Hydrazine	0,0,0,0,0,0,0,10
Nonyl phenol	0,0,0,0,0,0,0,11 0,0,0,0,0,0,0,12 0,0,0,0,0,0,0,13
Pentachlorophenol	0,0,0,0,0,0,0,14 0,0,0,0,0,0,0,15
Phenol	0,0,0,0,0,0,0,1 0,0,0,0,0,0,0,2 0,0,0,0,0,0,0,3 0,0,0,0,0,0,0,4 0,0,0,0,0,0,0,5 0,0,0,0,0,0,0,6

Substance	UV File
Phenol (cont'd)	0,0,0,0,0,0,0,7 0,0,0,0,0,0,0,8
2,4-Toluene diisocyanate	0,0,0,0,0,0,0,20 0,0,0,0,0,0,0,21

APPENDIX C

EXPERIMENTAL RESULTS IN THE CALIBRATION OF OVA UNITS IN THE "SNIFFER" MODE

GENERAL

The following points should be noted.

1. Each set of trials has an indication of the OVA unit involved as an identifying OVA number. The following corelates the number assigned to the OVA with the corresponding Serial Number.

OVA Number	Serial Number
1	C7389
2	C6969
3	C6955
4	D0051
5	D0177

2. The Corrected Meter Reading values (1) and (2) represent tests carried out at (1) equilibration and (2) 30 minutes after test (1).

3. The linear equation for each test set is given, together with the corresponding corelation coefficient. An average linear equation is also provided.

4. The response factor, relative to methane, is given as a percentage value for each test set.

ACETIC ACID CH_3COOH MW 60.05

TRIAL 1 OVA 2 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) 1.	Meter Reading Corrected (MRC) 2.
0	0.0	0.0
2	1.8	1.9
4	0.3	0.5
6	8.3	8.3
8	3.7	3.9
10	3.3	3.5
20	35.3	35.3
100	39.3	37.3
500	165.3	165.3
1000	335.3	315.3

Reject data for 0 to 20 ppm

	1.	2.
Slope	0.3293	0.3085
MRC intercept	4.32	8.09
Cor. coeff.	0.9998	0.9998
Relative response (% methane)	39.3	37.3

Ave. Rel. Resp. (% methane) 38.3

Linear eqn. Conc. (ppm) = $\frac{\text{MRC} - 4.32}{0.3293}$ $\frac{\text{MRC} - 8.09}{0.3085}$

Ave. linear eqn. Conc. (ppm) = $\frac{\text{MRC} - 6.20}{0.3189}$

Working Range

Meter Reading Corrected (MRC)	30 - 350
Acetic acid range (approx. ppm)	50 - 1000

ACETIC ACID CH_3COOH MW 60.05

TRIAL 1 OVA 3 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)	
Std. (ppm)	1.	2.
0	0.0	0.0
2	2.3	2.3
4	0.2	0.1
6	7.8	7.7
8	4.6	4.2
10	0.1	2.3
20	45.8	44.7
100	47.0	44.7
500	204.8	174.7
1000	394.8	364.7

Reject data for 0 to 20 ppm

	1.	2.
Slope	0.3862	0.3566
MRC intercept	9.57	4.54
Cor. coeff.	0.9999	0.9990
Relative response (% methane)	45.5	41.6

Ave. Rel. Resp. (% methane 43.5

Linear eqn. Conc. (ppm) = $\frac{MRC - 9.57}{0.3862}$ $\frac{MRC - 4.54}{0.3566}$

Ave. linear eqn. Conc. (ppm) = $\frac{MRC - 9.92}{0.3598}$

Working Range

Meter Reading Corrected (MRC)	30 - 350
Acetic acid range (approx. ppm)	50 - 1000

ACETIC ANHYDRIDE $(CH_3CO)_2O$ MW 102.1

TRIAL 1 OVA 2 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)	
Std. (ppm)	1.	2.
0	0.0	0.0
1	14.0	14.2
2	5.0	5.6
3	0.3	0.8
4	0.7	1.3
5	1.3	1.4
10	2.0	2.5
100	11.0	12.2
500	104.0	119.2
1000	199.0	219.2

Reject data for 0 to 10 ppm

	1.	2.
Slope	0.2081	0.2288
MRC intercept	- 6.33	- 5.14
Cor. coeff.	0.9983	0.9965
Relative response (% methane)	24.4	27.8
Ave. Rel. Resp. (% methane)	26.1	
Linear eqn. Conc. (ppm)	$\frac{MRC + 6.33}{0.2081}$	$\frac{MRC + 5.14}{0.2288}$

Ave. linear eqn. Conc. (ppm) $= \frac{MRC + 5.74}{0.2184}$

Working Range

Meter Reading Corrected (MRC)	10 - 250
Acetic anhydride range (approx. ppm)	50 - 1000

ACETIC ANHYDRIDE $(CH_3CO)_2O$ MW 102.1

TRIAL 1 OVA 3 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) 1.	Meter Reading Corrected (MRC) 2.
0	0.0	0.0
1	18.0	21.5
2	7.2	8.0
3	1.0	0.8
4	1.4	1.9
5	2.0	2.1
10	3.2	3.8
100	15.0	15.5
500	169.0	199.5
1000	319.0	379.5

Reject data for 0 to 10 ppm

	1.		2.
Slope	0.3362		0.4026
MRC intercept	- 11.66		- 16.56
Cor. coeff.	0.9974		0.9975
Relative response (% methane)	38.5		44.6
Ave. Rel. Resp. (% methane)		41.6	
Linear eqn. Conc. (ppm)	$\frac{MRC + 11.66}{0.3362}$		$\frac{MRC + 16.56}{0.4026}$
Ave. linear eqn. Conc. (ppm)		$\frac{MRC + 14.11}{0.3694}$	

Working Range

Meter Reading Corrected (MRC)	10 - 250
Acetic anhydride range (approx. ppm)	50 - 1000

ACETONE CH_3COCH_3 MW 58.1

TRIAL 1 OVA 1 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) 1.	Meter Reading Corrected (MRC) 2.
0	0.0	0.0
150	139.0	139.0
300	269.0	269.0
450	409.0	404.0
600	539.0	529.0
750	659.0	649.0
900	809.0	804.0
1350	---	---

Accept above data

	1.		2.
Slope	0.8898		0.8790
MRC intercept	3.04		3.57
Cor. coeff.	0.9998		0.9997
Rel. response (% methane)	92.0		91.5
Ave. Rel. Resp. (% methane)		91.8	
Linear eqn. Conc. (ppm)	$\frac{MRC - 3.04}{0.8898}$		$\frac{MRC - 3.57}{0.8790}$

Ave. linear eqn. Conc. (ppm) $\frac{MRC - 3.30}{0.8844}$

Working Range	
Meter Reading Corrected (MRC)	100 - 900
Acetone (approx. ppm)	100 - 1000

ACETONE CH_3COCH_3 MW 58.1

TRIAL 1 OVA 2 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)	
Std. (ppm)	1.	2.
0	0.0	0.0
150	77.0	74.0
300	99.0	99.0
450	149.0	139.0
600	189.0	189.0
750	219.0	209.0
900	269.0	269.0
1350	399.0	389.0

Accept above data

	1.	2.
Slope	0.2828	0.2773
MRC intercept	16.03	15.01
Cor. coeff.	0.9966	0.9961
Rel. response (% methane)	44.3	42.7
Ave. Rel. Resp. (% methane)	43.5	
Linear eqn. Conc. (ppm)	$\frac{MRC - 16.03}{0.2828}$	$\frac{MRC - 15.01}{0.2773}$
Ave. linear eqn. Conc. (ppm)	$\frac{MRC - 15.52}{0.2801}$	

Working Range

Meter Reading Corrected (MRC)	50 - 500
Acetone (approx. ppm)	100 - 1500

ACETONE CH_3COCH_3 MW 58.1

TRIAL 1 OVA 3 MYLAR BAGS

Total volume; 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) 1.	Meter Reading Corrected (MRC) 2.
0	0.0	0.0
150	90.0	87.0
300	199.0	199.0
450	279.0	279.0
600	379.0	359.0
750	459.0	449.0
900	559.0	589.0
1350	859.0	849.0

Accept above data

Slope	0.6309		0.6316
MRC intercept	- 1.90		- 3.88
Cor. coeff.	0.9996		0.9986
Rel. response (% methane)	61.2		59.3
Ave. Rel. Resp. (% methane)		60.3	
Linear eqn. Conc. (ppm)	$\frac{MRC + 1.90}{0.6309}$		$\frac{MRC + 3.88}{0.6316}$
Ave. linear eqn. Conc. (ppm)		$\frac{MRC + 2.88}{0.6312}$	

Working Range

Meter Reading Corrected (MRC)	50 - 1000
Acetone (approx. ppm)	100 - 1500

ACRYLONITRILE $CH_2=CHCN$ MW 53.1

TRIAL 1 OVA 2 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) 1.	Meter Reading Corrected (MRC) 2.
0	0.0	0.0
1	3.6	2.5
2	4.95	3.35
4	8.05	5.75
100	56.2	55.8
1000	224.2	221.3
2000	474.2	466.3
4000	off-scale	

For data 0 - 100 ppm

	1.		2.
Slope	0.5313		0.5393
MRC intercept	3.19		1.94
Cor. coeff.	0.9959		0.9985
Linear eqn. Conc. (ppm)	$\frac{MRC - 3.19}{0.5313}$		$\frac{MRC - 1.94}{0.5393}$
Ave. linear eqn. Conc. (ppm)		$\frac{MRC - 2.58}{0.5352}$	

For data 100 - 2000 ppm

	1.		2.
Slope	0.2206		0.2166
MRC intercept	23.63		23.99
Cor. coeff.	0.9966		0.9967
Linear eqn. Conc. (ppm)	$\frac{MRC - 23.63}{0.2206}$		$\frac{MRC - 23.99}{0.2166}$
Ave. linear eqn. Conc. (ppm)		$\frac{MRC - 23.82}{0.2186}$	
Rel. response (% methane)	31.0		29.8
Ave. Rel. Resp. (% methane)		30.4	

Working Range

(0 - 100 ppm)	Meter Reading Corrected (MRC)	5 - 60
	Acrylonitrile (approx. ppm)	2 - 100
(100 - 2000 ppm)	Meter Reading Corrected (MRC)	50 - 600
	Acrylonitrile (approx. ppm)	100 - 2000

ACRYLONITRILE CH$_2$=CHCN MW 53.1

TRIAL 1 OVA 3 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) 1.	Meter Reading Corrected (MRC) 2.
0	0.0	0.0
1	2.3	2.2
2	3.65	3.32
4	6.6	6.12
100	65.9	67.2
1000	274.4	269.7
2000	519.4	504.7
4000	off-scale	

For data 0 - 100 ppm

	1.	2.
Slope	0.6399	0.6553
MRC intercept	2.00	1.74
Cor. coeff.	0.9987	0.9991
Linear eqn. Conc. (ppm)	$\frac{MRC - 2.00}{0.6399}$	$\frac{MRC - 1.74}{0.6553}$

Ave. linear eqn. Conc. (ppm) $\frac{MRC - 1.87}{0.6471}$

For data 100 - 2000 ppm

	1.	2.
Slope	0.2388	0.2304
MRC intercept	39.81	42.50
Cor. coeff.	0.9999	0.9999
Linear eqn. Conc. (ppm)	$\frac{MRC - 39.81}{0.2388}$	$\frac{MRC - 42.50}{0.2304}$

Ave. linear eqn. Conc. (ppm) $\frac{MRC - 41.14}{0.2346}$

	1.	2.
Rel. response (% methane)	36.3	36.0

Ave. Rel. Resp. (% methane) 36.2

Working Range

(0 - 100 ppm)	Meter Reading Corrected (MRC)	5 - 70
	Acrylonitrile (approc. ppm)	2 - 100
(100 - 2000 ppm)	Meter Reading Corrected (MRC)	50 - 600
	Acrylonitrile (aaprox. ppm)	100 - 2000

ACRYLONITRILE CH_2=CHCN MW 53.1

TRIAL 1 OVA 4 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) 1.	Meter Reading Corrected (MRC) 2.
0	0.0	0.0
1	1.55	1.75
2	2.45	3.00
4	4.45	5.25
100	64.1	58.7
1000	294.1	283.7
2000	574.1	543.7
4000	off-scale	

For data 0 - 100 ppm

	1.	2.
Slope	0.6314	0.5728
MRC intercept	1.00	1.48
Cor. coeff.	0.9997	0.9991
Linear eqn. Conc. (ppm)	$\frac{MRC - 1.00}{0.6314}$	$\frac{MRC - 1.48}{0.5728}$

Ave. linear eqn. Conc. (ppm) $\frac{MRC - 1.25}{0.6020}$

For data 100 - 2000 ppm

	1.	2.
Slope	0.2686	0.2554
MRC intercept	33.18	31.50
Cor. coeff.	0.9997	0.9999
Linear eqn. Conc. (ppm)	$\frac{MRC - 33.18}{0.2686}$	$\frac{MRC - 31.50}{0.2554}$

Ave. linear eqn. Conc. (ppm) $\frac{MRC - 32.69}{0.2620}$

	1.	2.
Rel. response (% methane)	36.7	30.2

Ave. Rel. Resp. (% methane) 33.5

Working Range

(0 - 100 ppm)	Meter Reading Corrected (MRC)	5 - 70
	Acrylonitrile (approx. ppm)	2 - 100
(100 - 2000 ppm)	Meter Reading Corrected (MRC)	70 - 60
	Acrylonitrile (approx. ppm)	100 - 2

ACRYLONITRILE $CH_2=CHCN$ MW 53.1

TRIAL 1 OVA 5 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) 1.	 2.
0	0.0	0.0
1	2.1	1.75
2	3.4	2.55
4	5.92	4.45
100	58.6	63.4
1000	269.1	269.4
2000	544.1	519.4
4000	off-scale	

For data 0 - 100 ppm

	1.		2.
Slope	0.5684		0.6235
MRC intercept	1.84		1.09
Cor. coeff.	0.9986		0.9997
Linear eqn. Conc. (ppm)	$\frac{MRC - 1.84}{0.5684}$		$\frac{MRC - 1.09}{0.6235}$
Ave. linear eqn. Conc. (ppm)		$\frac{MRC - 1.50}{0.5955}$	

For data 100 - 2000 ppm

	1.		2.
Slope	0.2559		0.2402
MRC intercept	26.18		35.88
Cor. coeff.	0.9989		0.9997
Linear eqn. Conc. (ppm)	$\frac{MRC - 26.18}{0.2559}$		$\frac{MRC - 35.88}{0.2402}$
Ave. linear eqn. Conc. (ppm)		$\frac{MRC - 31.06}{0.2480}$	
Rel. response (% methane)	34.2		34.7
Ave. Rel. Resp. (% methane)		34.5	

Working Range

(0 - 100 ppm)	Meter Reading Corrected (MRC)	5 - 70
	Acrylonitrile (approx. ppm)	2 - 100
(100 - 2000 ppm)	Meter Reading Corrected (MRC)	50 - 600
	Acrylonitrile (approx. ppm)	100 - 2000

ARSINE AsH_3 MW 77.95

TRIAL 1 OVA 1, 2, 3, 4 and 5 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: pure gas

BENZENE C_6H_6 MW 78.1

TRIAL 1 OVA 2 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)	
Std. (ppm)	1.	2.
0	0.0	0.0
2	3.00	2.50
4	4.50	4.92
6	12.5	12.5
8	15.0	14.0
10	18.0	17.0
20	30.0	29.0
100	157.0	155.5
500	631.0	635.5

Accept all data

	1.	2.
Slope	1.2603	1.2700
MRC intercept	5.76	5.05
Cor. coeff.	0.9989	0.9991

Linear eqn. Conc. (ppm) $\frac{MRC - 5.76}{1.2603}$ $\frac{MRC - 5.05}{1.2700}$

Ave. linear eqn. Conc. (ppm) $\frac{MRC - 5.41}{1.2650}$

Rel. response (% methane) 131.8 132.0

Ave. Rel. Resp. (% methane) 131.9

Working Range

Meter Reading Corrected (MRC)	10 - 700
Benzene (approx. ppm)	5 - 500

BENZENE C_6H_6 MW 78.1

TRIAL 1 OVA 3 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)	
Std. (ppm)	1.	2.
0	0.0	0.0
2	5.35	3.30
4	8.10	8.00
6	16.5	15.0
8	20.0	16.5
10	24.0	21.0
20	43.5	41.5
100	177.0	173.5
500	804.0	785.5

Accept all data

	1.	2.
Slope	1.5995	1.5656
MRC intercept	6.53	5.18
Cor. coeff.	0.9998	0.9998
Linear eqn. Conc. (ppm)	$\frac{MRC - 6.53}{1.5995}$	$\frac{MRC - 5.18}{1.5656}$

Ave. linear eqn. Conc. (ppm) $\frac{MRC - 5.87}{1.5826}$

Rel. response (% methane) 166.5 161.7

Ave. Rel. Resp. (% methane) 164.1

Working Range

Meter Reading Corrected (MRC)	10 - 900
Benzene (approx. ppm)	5 - 500

1,3-BUTADIENE $CH_2=CHCH=CH_2$ MW 54.1

TRIAL 1   OVA 2   MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)	
Std. (ppm)	1.	2.
0	0.0	0.0
200	32.5	33.6
400	100.5	107.6
600	180.5	182.6
800	216.5	215.6
1000	323.5	322.6

Accept all data

	1.	2.
Slope	0.3214	0.3191
MRC intercept	- 18.43	- 15.90
Cor. coeff.	0.9894	0.9899
Linear eqn. Conc. (ppm)	$\frac{MRC + 18.43}{0.3214}$	$\frac{MRC + 15.90}{0.3191}$
Ave. linear eqn. Conc. (ppm)	$\frac{MRC + 17.17}{0.3202}$	
Rel. response (% methane)	13.7	16.0
Ave. Rel. Resp. (% methane)	14.9	

Working Range

Meter Reading Corrected (MRC)	25 - 400
1,3-Butadiene (approx. ppm)	150 - 1000

1,3-BUTADIENE $CH_2=CHCH=CH_2$ MW 54.1

TRIAL 1 OVA 5 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)	
Std. (ppm)	1.	2.
0	0.0	0.0
200	32.4	32.4
400	99.4	100.4
600	161.4	158.4
800	194.4	188.4
1000	297.4	294.4

Accept all data

	1.	2.
Slope	0.2907	0.2869
MRC intercept	- 14.52	- 14.10
Cor. coeff.	0.9888	0.9864
Linear eqn. Conc. (ppm)	$\frac{MRC + 14.52}{0.2907}$	$\frac{MRC + 14.10}{0.2869}$

Ave. linear eqn. Conc. (ppm) $\frac{MRC + 14.12}{0.2881}$

	1.	2.
Rel. response (% methane)	14.5	14.6

Ave. Rel. Resp. (% methane) 14.6

Working Range	
Meter Reading Corrected (MRC)	25 - 400
1,3-Butadiene (approx. ppm)	150 - 1000

BUTANOL $CH_3(CH_2)_3OH$ MW 74.1

TRIAL 1 OVA 1 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)	
Std. (ppm)	1.	2.
0	0.0	0.0
10	4.1	4.2
20	7.8	7.8
40	22.0	21.0
50	27.0	26.0
100	51.0	50.0
500	204.0	204.0

Accept all data

	1.	2.
Slope	0.4043	0.4049
MRC intercept	3.54	3.07
Cor. coeff.	0.9983	0.9987
Linear eqn. Conc. (ppm)	$\frac{MRC - 3.54}{0.4043}$	$\frac{MRC - 3.07}{0.4049}$

Ave. linear eqn. Conc. (ppm) $\frac{MRC - 3.32}{0.4045}$

	1.	2.
Rel. response (% methane)	44.0	43.6

Ave. Rel. Resp. (% methane) 43.8

Working Range

Meter Reading Corrected (MRC)	4 - 300
Butanol (approx. ppm)	10 - 500

BUTANOL $CH_3(CH_2)_3OH$ MW 74.1

TRIAL 1 OVA 2 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) 1.	Meter Reading Corrected (MRC) 2.
0	0.0	0.0
10	4.5	4.7
20	8.8	8.8
40	15.5	15.5
50	18.0	18.0
100	33.0	33.0
500	99.0	99.0

Accept all data

	1.		2.
Slope	0.1897		0.1896
MRC intercept	6.03		6.07
Cor. coeff.	0.9909		0.9910
Linear eqn. Conc. (ppm)	$\frac{MRC - 6.03}{0.1897}$		$\frac{MRC - 6.07}{0.1896}$
Ave. linear eqn. Conc. (ppm)		$\frac{MRC - 6.05}{0.1898}$	
Rel. response (% methane)	25.0		25.0
Ave. Rel. Resp. (% methane)		25.0	

Working Range

Meter Reading Corrected (MRC)	8 - 150
Butanol (aaprox. ppm)	10 - 500

BUTANOL $CH_3(CH_2)_3OH$ MW 74.1

TRIAL 1 OVA 3 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) 1.	Meter Reading Corrected (MRC) 2.
0	0.0	0.0
10	3.3	3.3
20	6.0	6.0
40	15.0	15.0
50	18.0	18.0
100	34.0	34.0
500	124.0	124.0

Accept all data

	1.		2.
Slope	0.2438		0.2438
MRC intercept	3.54		3.54
Cor. coeff.	0.9968		0.9968
Linear eqn. Conc. (ppm)	$\frac{MRC - 3.54}{0.2438}$		$\frac{MRC - 3.54}{0.2438}$
Ave. linear eqn. Conc. (ppm)		$\frac{MRC - 3.54}{0.2438}$	
Rel. response (% methane)	27.9		27.9
Ave. Rel. Resp. (% methane)		27.9	

Working Range

Meter Reading Corrected (MRC)	4 - 200
Butanol (approx. ppm)	10 - 500

BUTYLENE $CH_3CH_2CH{=}CH_2$ MW 56.1

TRIAL 1 OVA 2 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) 1.	2.
0	0.0	0.0
500	144.5	153.2
1000	334.5	348.2
5000	off-scale	

Accept all data

	1.		2.
Slope	0.3345		0.3482
MRC intercept	- 7.58		- 6.97
Cor. coeff.	0.9969		0.9976
Linear eqn. Conc. (ppm)	$\frac{MRC + 7.58}{0.3345}$		$\frac{MRC + 6.97}{0.3482}$
Ave. linear eqn. Conc. (ppm)		$\frac{MRC + 7.27}{0.3414}$	
Rel. response (% methane)	25.9		27.8
Ave. Rel. Resp. (% methane)		26.9	

Working Range

Meter Reading Corrected (MRC)	10 - 400
Butylene (approx. ppm)	50 - 1000

BUTYLENE $CH_3CH_2CH=CH_2$ MW 56.1

TRIAL 1 OVA 5 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) 1.	Meter Reading Corrected (MRC) 2.
0	0.0	0.0
500	141.0	138.7
1000	319.0	319.7
5000	off-scale	

Accept all data

	1.		2.
Slope	0.3190		0.3197
MRC intercept	- 6.17		- 6.72
Cor. coeff.	0.9978		0.9974
Linear eqn. Conc. (ppm)	$\frac{MRC + 6.17}{0.3190}$		$\frac{MRC + 6.72}{0.3197}$
Ave. linear eqn. Conc. (ppm)		$\frac{MRC + 6.47}{0.3194}$	
Rel. response (% methane)	25.7		25.2
Ave. Rel. Resp. (% methane)		25.5	

Working Range

Meter Raeding Corrected (MRC)	10 - 400
Butylene (approx. ppm)	50 - 1000

BUTYRALDEHYDE $CH_3(CH_2)_2CHO$ MW 72.1

TRIAL 1 OVA 1 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) 1.	Meter Reading Corrected (MRC) 2.
0	0.0	0.0
20	3.0	2.0
40	13.0	12.3
60	17.0	15.3
80	23.0	20.3
100	36.0	36.3
500	239.0	228.3
1000	544.0	518.3

Accept all data

	1.	Average	2.
Slope	0.5463		0.5211
MRC intercept	- 13.55		- 13.14
Cor. coeff.	0.9983		0.9984
Linear eqn. Conc. (ppm)	$\frac{MRC + 13.55}{0.5463}$		$\frac{MRC + 13.14}{0.5211}$
Ave. linear eqn. Conc. (ppm)		$\frac{MRC + 13.38}{0.5340}$	
Rel. response (% methane)	41.1		39.0
Ave. Rel. Resp. (% methane)		40.1	

Working Range

Meter Reading Corrected (MRC)	2 - 600
Butyraldehyde (approx. ppm)	10 - 1000

BUTYRALDEHYDE $CH_3(CH_2)_2CHO$ MW 72.1

TRIAL 1 OVA 2 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) 1.	Meter Reading Corrected (MRC) 2.
0	0.0	0.0
20	3.1	2.1
40	11.0	11.4
60	14.0	13.4
80	20.0	17.4
100	28.0	27.4
500	144.0	138.4
1000	289.0	288.4

Accept all data

	1.		2.
Slope	0.2909		0.2894
MRC intercept	- 1.81		- 2.79
Cor. coeff.	0.9999		0.9997
Linear eqn. Conc. (ppm)	$\frac{MRC + 1.81}{0.2809}$		$\frac{MRC + 2.79}{0.2894}$
Ave. linear eqn. Conc. (ppm)		$\frac{MRC + 2.30}{0.2901}$	
Rel. Response (% methane)	27.3		26.1
Ave. Rel. Resp. (% methane)		26.7	

Working Range

Meter Reading Corrected (MRC)	2 - 400
Butyraldehyde (approx. ppm)	10 - 1000

BUTYRALDEHYDE $CH_3(CH_2)_2CHO$ MW 72.1

TRIAL 1 OVA 3 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)	
Std. (ppm)	1.	2.
0	0.0	0.0
20	2.8	1.5
40	11.0	10.2
60	14.0	12.2
80	19.0	16.2
100	29.0	29.2
500	169.0	168.2
1000	389.0	368.2

Accept all data

	1.	2.
Slope	0.3883	0.3707
MRC intercept	- 8.14	- 7.70
Cor. coeff.	0.9982	0.9990
Linear eqn. Conc. (ppm)	$\frac{MRC + 8.14}{0.3883}$	$\frac{MRC + 7.70}{0.3707}$
Ave. linear eqn. Conc. (ppm)	$\frac{MRC + 7.91}{0.3795}$	
Rel. response (% methane)	30.7	29.4
Ave. Rel. Resp. (% methane)	30.1	

Working Range

Meter Reading Corrected (MRC)	2 - 400
Butyraldehyde (approx. ppm)	10 - 1000

CARBON DISULPHIDE CS_2 MW 76.1

TRIAL 1 OVA 1, 2 and 3 MYLAR BAGS

Total volume: 44.0 liters

No response

CARBON TETRACHLORIDE CCl_4 MW 153.8

TRIAL 1 OVA 1 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)	
Std. (ppm)	1.	2.
0	0.0	0.0
5	1.7	1.2
10	0.8	0.3
15	1.7	1.1
20	6.1	6.1
50	4.4	3.6
100	8.5	5.4
3000	199.0	199.0

Accept all data

	1.	2.
Slope	0.0659	0.0661
MRC intercept	1.43	0.65
Cor. coeff.	0.9998	0.9997
Linear eqn. Conc. (ppm)	$\frac{MRC - 1.43}{0.0659}$	$\frac{MRC - 0.65}{0.0661}$

Ave. linear eqn. Conc. (ppm) $\frac{MRC - 1.06}{0.0660}$

	1.	2.
Rel. response (% methane)	8.0	7.2

Ave. Rel. Resp. (% methane) 7.6

Working Range

Meter Reading Corrected (MRC)	4 - 300
Carbon tetrachloride (approx. ppm)	40 - 3000

CARBON TETRACHLORIDE CCl_4 MW 153.8

TRIAL 1 OVA 2 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) 1.	Meter Reading Corrected (MRC) 2.
0	0.0	0.0
5	1.3	1.1
10	0.2	0.4
15	1.1	1.2
20	6.4	6.6
50	3.2	4.6
100	5.0	5.0
3000	95.0	93.0

Accept all data

	1.		2.
Slope	0.0312		0.0304
MRC intercept	1.56		1.83
Cor. coeff.	0.9984		0.9981
Linear eqn. Conc. (ppm)	$\frac{MRC - 1.56}{0.0312}$		$\frac{MRC - 1.83}{0.0304}$
Ave. linear eqn. Conc. (ppm)		$\frac{MRC - 1.69}{0.0311}$	
Rel. response (% methane)	4.6		4.9
Ave. Rel. Resp. (% methane)		4.8	

Working Range	
Meter Reading Corrected (MRC)	4 - 200
Carbon tetrachloride (approx. ppm)	40 - 3000

CARBON TETRACHLORIDE CCl_4 MW 153.8

TRIAL 1 OVA 3 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)	
Std. (ppm)	1.	2.
0	0.0	0.0
5	1.3	1.0
10	0.2	).3
15	1.0	0.9
20	5.2	4.6
50	3.5	3.6
100	5.0	4.6
3000	139.0	139.0

Accept all data

	1.		2.
Slope	0.0460		0.0461
MRC intercept	1.00		0.83
Cor. coeff.	0.9996		0.9997
Linear eqn. Conc. (ppm)	$\frac{MRC - 1.00}{0.0460}$		$\frac{MRC - 0.83}{0.0461}$
Ave. linear eqn. Conc. (ppm)		$\frac{MRC - 0.94}{0.0460}$	
Rel. response (% methane)	5.6		5.4
Ave. Rel. Resp. (% methane)		5.5	

Working Range	
Meter Reading Corrected (MRC)	4 - 200
Carbon tetrachloride (approx. ppm)	40 - 3000

CHLOROFORM $CHCl_3$ MW 119.4

TRIAL 1 OVA 1 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) 1.	Meter Reading Corrected (MRC) 2.
0	0.0	0.0
5	4.0	2.4
10	12.0	10.1
20	19.0	17.1
50	38.0	37.1
100	67.0	65.1
500	379.0	387.1
1000	709.0	697.1

Accept all data

	1.		2.
Slope	0.7146		0.7084
MRC intercept	2.98		2.78
Cor. coeff.	0.9995		0.9987
Linear eqn. Conc. (ppm)	$\frac{MRC - 2.98}{0.7146}$		$\frac{MRC - 2.78}{0.7084}$
Ave. linear eqn. Conc. (ppm)		$\frac{MRC - 2.92}{0.7115}$	
Rel. response (% methane)	74.4		73.6
Ave. Rel. Resp. (% methane)		74.0	

Working Range

Meter Reading Corrected (MRC)	5 - 800
Chloroform (approx. ppm)	5 - 1000

CHLOROFORM $CHCl_3$ MW 119.4

TRIAL 1 OVA 2 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)	
Std. (ppm)	1.	2.
0	0.0	0.0
5	4.2	3.0
10	11.0	9.7
20	14.0	12.7
50	29.0	26.7
100	48.0	45.7
500	149.0	147.7
1000	239.0	237.7

Accept all data

	1.	2.
Slope	0.2379	0.2379
MRC intercept	11.66	10.29
Cor. coeff.	0.9917	0.9923
Linear eqn. Conc. (ppm)	$\frac{MRC - 11.66}{0.2379}$	$\frac{MRC - 10.29}{0.2379}$

Ave. linear eqn. Conc. (ppm) $\frac{MRC - 10.99}{0.2378}$

	1.	2.
Rel. Response (% methane)	35.4	34.1

Ave. Rel. Resp. (% methane) 34.7

Working Range

Meter Reading Corrected (MRC)	20 - 300
Chloroform (approx. ppm)	50 - 1000

CHLOROFORM $CHCl_3$ MW 119.4

TRIAL 1   OVA 3   MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)	
Std. (ppm)	1.	2.
0	0.0	0.0
5	2.6	2.0
10	8.2	7.7
20	15.0	14.5
50	32.0	30.5
100	52.0	52.5
500	269.0	268.5
1000	499.0	488.5

Accept all data

	1.		2.
Slope	0.5019		0.4932
MRC intercept	4.01		4.15
Cor. coeff.	0.9994		0.9990
Linear eqn. Conc. (ppm)	$\frac{MRC - 4.13}{0.5019}$		$\frac{MRC - 4.15}{0.4932}$
Ave. linear eqn. Conc. (ppm)		$\frac{MRC - 4.13}{0.4973}$	
Rel. response (% methane)	54.2		53.5
Ave. Rel. Resp. (% methane)		53.9	

Working Range

Working Range	
Meter Reading Corrected (MRC)	10 - 600
Chloroform (approx. ppm)	15 - 1000

CUMENE $C_6H_5CH(CH_3)_2$ MW 120.2

TRIAL 1 OVA 1 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)	
Std. (ppm)	1.	2.
0	0.0	no
10	13.0	
20	41.0	data
30	49.0	
40	19.0	obtained
50	25.0	
100	55.0	
500	299.0	
1000	559.0	

Accept all data

Slope	0.5537
MRC intercept	10.11
Cor. coeff,	0.9972

Linear eqn. Conc. (ppm) $\frac{\text{MRC} - 10.11}{0.5537}$

Rel. response (% methane) 65.5

Working Range	
Meter Reading Corrected (MRC)	15 - 600
Cumene (approx. ppm)	40 - 1000

CUMENE $C_6H_5CH(CH_3)_2$ MW 120.2

TRIAL 1 OVA 2 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) 1.	Meter Reading Corrected (MRC) 2.
0	0.0	0.0
10	7.5	8.4
20	26.0	24.4
30	28.0	27.4
40	12.0	11.4
50	16.0	15.4
100	30.0	30.4
500	129.0	128.4
1000	219.0	218.4

Accept all data

	1.	2.
Slope	0.2143	0.2140
MRC intercept	10.27	9.97
Cor. coeff.	0.9927	0.9932
Linear Eqn. Conc. (ppm)	$\frac{MRC - 10.27}{0.2143}$	$\frac{MRC - 9.97}{0.2140}$
Rel. response (% methane)	31.7	31.4

Ave. linear eqn. Conc. (ppm) $\frac{MRC - 10.12}{0.2142}$

Ave. Rel. Resp. (% methane) 31.6

Working Range

Meter Reading Corrected (MRC)	15 - 300
Cumene (approx. ppm)	40 - 1000

CUMENE $C_6H_5CH(CH_3)_2$ MW 120.2

TRIAL 1 OVA 3 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)	
Std. (ppm)	1.	2.
0	0.0	0.0
10	11.0	9.6
20	35.0	33.6
30	41.0	37.6
40	17.0	13.6
50	21.0	18.6
100	43.0	40.6
500	209.0	206.6
1000	399.0	386.6

Accept all data

	1.	2.
Slope	0.3898	0.3806
MRC intercept	10.42	8.98
Cor. coeff.	0.9966	0.9964
Linear eqn. Conc. (ppm)	$\frac{MRC - 10.42}{0.3898}$	$\frac{MRC - 8.98}{0.3806}$

Ave. linear eqn. Conc. (ppm) $\frac{MRC - 9.70}{0.3852}$

	1.	2.
Rel. response (% methane)	49.4	47.0

Ave. Rel. Resp. (% methane) 48.2

Working Range	
Meter Reading Corrected (MRC)	15 - 500
Cumene (approx. ppm)	40 - 1000

CYCLOHEXANE C_6H_{12} MW 84.2

TRIAL 1 OVA 2 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) 1.	 2.
0	0.0	0.0
50	35.5	35.1
100	59.5	60.1
150	76.5	76.1
200	106.5	116.1
250	136.5	136.1
300	166.5	156.1
400	196.5	196.1
600	311.5	316.1

Accept all data

	1.	2.
Slope	0.5062	0.5085
MRC intercept	5.69	5.48
Cor. coeff.	0.9977	0.9974
Linear eqn. Conc. (ppm)	$\frac{MRC - 5.69}{0.5062}$	$\frac{MRC - 5.48}{0.5085}$

Ave. linear eqn. Conc. (ppm) $\frac{MRC - 5.59}{0.5074}$

	1.	2.
Rel. response (% methane)	56.3	56.3

Ave. Rel. Resp. (% methane) 56.3

Working Range

Meter Reading Corrected (MRC)	15 - 400
Cyclohexane (approx. ppm)	25 - 600

CYCLOHEXANE C_6H_{12} MW 84.2

TRIAL 1 OVA 3 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) 1.	Meter Reading Corrected (MRC) 2.
0	0.0	0.0
50	47.1	47.2
100	75.1	75.2
150	94.1	96.2
200	137.1	147.2
250	177.1	177.2
300	227.1	227.2
400	287.1	287.2
600	487.1	477.2

Accept all data

	1.	2.
Slope	0.7913	0.7765
MRC intercept	- 10.03	- 6.37
Cor. coeff.	0.9950	0.9965
Linear eqn. Conc. (ppm)	$\frac{MRC + 10.03}{0.7913}$	$\frac{MRC + 6.37}{0.7765}$

Ave. linear eqn. Conc. (ppm) $\frac{MRC - 8.17}{0.7839}$

	1.	2.
Rel. response (% methane)	69.1	71.3

Ave. Rel. Resp. (% methane) 70.2

Working Range

Meter Reading Corrected (MRC)	15 - 500
Cyclohexane (approx. ppm)	25 - 600

o-DICHLOROBENZENE $C_6H_4Cl_2$ MW 147.0

TRIAL 1 OVA 2 and 5 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)			
	OVA 2		OVA 5	
Std. (ppm)	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0
15	4.8	5.3	4.5	4.95
30	7.2	6.1	5.8	5.0
45	13.7	11.1	12.3	8.0
60	15.0	11.6	13.8	10.0
75	20.7	15.1	19.8	14.5
150	49.7	38.6	50.8	37.3
500	79.2	74.6	78.8	77.5
1000	134.2	118.6	125.8	107.5

Accept all data

Slope	0.1308	0.1187	0.1241	0.1107
MRC intercept	8.80	6.11	8.76	6.36
Cor. coeff.	0.9792	0.9835	0.9710	0.9721
Linear eqn. Conc. (ppm)	$\frac{MRC-8.80}{0.1308}$	$\frac{MRC-6.11}{0.1187}$	$\frac{MRC-8.76}{0.1241}$	$\frac{MRC-6.36}{0.1107}$
Ave. linear eqn. Conc. (ppm)	$\frac{MRC-7.70}{0.1245}$		$\frac{MRC-7.58}{0.1174}$	
Rel. response (% methane)	21.9	18.0	21.2	17.4
Ave. Rel. Resp. (% methane)	20.0		19.3	

Working Range

OVA 2	Meter Reading Corrected (MRC)	15 - 200
	o-Dichlorobenzene (approx. ppm)	50 - 1000
OVA 5	Meter Reading Corrected (MRC)	15 - 200
	o-Dichlorobenzene (approx. ppm)	50 - 1000

DIMETHYLAMINE $(CH_3)_2NH$ MW 45.1

TRIAL 1   OVA 1, 2, 3, 4 and 5   MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 20 ppm

ETHANOL C_2H_5OH MW 46.1

TRIAL 1 OVA 1 and 2 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)			
	OVA 1		OVA 2	
Std. (ppm)	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0
100	33.0	32.0	23.0	22.0
190	48.0	47.0	32.0	32.0
380	149.0	149.0	78.0	76.0
760	279.0	269.0	99.0	99.0
950	369.0	364.0	129.0	129.0
1850	779.0	749.0	259.0	244.0

Accept all data

	OVA 1, 1.	OVA 1, 2.	OVA 2, 1.	OVA 2, 2.
Slope	0.4223	0.4067	0.1341	0.1271
MRC intercept	-18.50	-15.75	7.51	9.17
Cor. coeff.	0.9982	0.9983	0.9935	0.9942
Linear eqn. Conc. (ppm)	$\frac{MRC+18.50}{0.4223}$	$\frac{MRC+15.75}{0.4067}$	$\frac{MRC-7.51}{0.1341}$	$\frac{MRC-9.17}{0.1271}$
Ave. linear eqn. Conc. (ppm)	$\frac{MRC+17.13}{0.4145}$		$\frac{MRC-8.34}{0.1306}$	
Rel. response (% methane)	23.7	24.9	20.9	21.9
Ave. Rel. Resp. (% methane)	24.3		21.4	

Working Range

OVA 1	Meter Reading Corrected (MRC)	15 - 800
	Ethanol (approx. ppm)	50 - 1850
OVA 2	Meter Reading Corrected (MRC)	15 - 300
	Ethanol (approx. ppm)	50 - 1850

ETHANOL C_2H_5OH MW 46.1

TRIAL 1 OVA 3 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	METER READING CORRECTED (MRC) 1.	2.
0	0.0	0.0
100	24.0	24.0
190	35.0	34.0
380	83.0	80.0
760	189.0	179.0
950	219.0	219.0
1850	509.0	499.0

Accept all data

	1.	2.
Slope	0.2736	0.2684
MRC intercept	- 14.02	- 14.37
Cor. coef.	0.9963	0.9966
Linear eqn. Conc. (ppm)	$\frac{MRC + 14.02}{0.2736}$	$\frac{MRC + 14.37}{0.2684}$
Ave. linear eqn. Conc. (ppm)	$\frac{MRC + 14.26}{0.2734}$	
Rel. response (% methane)	13.3	12.5
Ave. Rel. Resp. (% methane)	12.9	

Working Range	
Meter Reading Corrected (MRC)	15 - 600
Ethanol (approx. ppm)	50 - 1850

ETHANOLAMINE $H_2NCH_2CH_2OH$ MW 61.1

TRIAL 1 OVA 1, 2 and 3 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 100 ppm

ETHYL BENZENE $C_6H_5C_2H_5$ MW 106.2

TRIAL 1 OVA 1 and 2 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)			
	OVA 1		OVA 2	
Std. (ppm)	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0
20	20.0	5.5	9.0	-
40	27.0	16.0	15.0	5.5
60	38.0	27.0	22.0	14.0
80	53.0	42.0	31.0	31.0
100	62.0	65.0	39.0	38.0
200	159.0	164.0	78.0	78.0
500	429.0	429.0	139.0	139.0
1000	899.0	929.0	269.0	259.0
2000	off-scale		469.0	564.0

Accept all values

Slope	0.9044	0.9403	0.2350	0.2760
MRC intercept	-13.53	-22.56	13.12	3.32
Cor. coef.	0.9993	0.9992	0.9967	0.9980
Linear eqn. Conc. (ppm)	$\frac{MRC+13.53}{0.9044}$	$\frac{MRC+22.56}{0.9403}$	$\frac{MRC-13.12}{0.2350}$	$\frac{MRC-3.32}{0.2760}$
Ave. linear eqn. Conc. (ppm)	$\frac{MRC+18.00}{0.9223}$		$\frac{MRC-8.23}{0.2555}$	
Rel. response (% methane)	76.9	71.5	36.6	30.9
Ave. Rel. Resp. (% methane)	74.2		33.8	

Working Range

OVA 1	Meter Reading Corrected (MRC)	20 - 1000
	Ethyl benzene (approx. ppm)	40 - 1000
OVA 2	Meter Reading Corrected (MRC)	20 - 600
	Ethyl benzene (approx. ppm)	50 - 2000

ETHYL BENZENE $C_6H_5C_2H_5$ MW 106.2

TRIAL 1 OVA 3 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) 1.	 2.
0	0.0	0.0
20	14.0	7.4
40	21.0	16.4
60	32.0	25.4
80	45.0	29.4
100	56.0	50.3
200	109.0	105.4
500	314.0	305.4
1000	699.0	675.4
2000	off-scale	

Accept all data

	1.		2.
Slope	0.6955		0.6788
MRC intercept	- 11.22		- 15.81
Cor. coef.	0.9984		0.9986
Linear eqn. Conc. (ppm)	$\frac{\text{MRC} + 11.22}{0.6955}$		$\frac{\text{MRC} + 15.81}{0.6788}$
Ave. linear eqn. Conc. (ppm)		$\frac{\text{MRC} + 13.52}{0.6871}$	
Rel. response (% methane)	58.3		52.1
Ave. Rel. Resp. (% methane)		55.2	

Working Range

Meter Reading Corrected (MRC)	15 - 750
Ethyl benzene (approx. ppm)	20 - 1000

2-ETHYL HEXANOL $CH_3(CH_2)_3CH(C_2H_5)CH_2OH$ MW 130.2

TRIAL 1 OVA 1 and 2 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)			
	OVA 1		OVA 2	
Std. (ppm)	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0
20	3.6	-0.4	3.8	0.4
40	21.0	15.5	14.0	7.4
60	18.0	11.5	12.0	6.4
80	36.0	30.5	23.5	19.4
100	31.0	13.5	22.0	9.4
500	46.0	48.5	28.0	26.4
1000	94.0	143.5	63.0	66.4

Reject: 20 - 100 all data test 2, OVA 1

Slope	0.0940	0.0630	0.0664
MRC intercept	-0.33	-1.17	-2.27
Cor. coef.	0.9999	0.9979	0.9931
Linear eqn. Conc. (ppm)	$\frac{MRC+0.33}{0.0940}$	$\frac{MRC+1.17}{0.0630}$	$\frac{MRC+2.27}{0.0664}$
Ave. linear eqn. Conc. (ppm)		$\frac{MRC+1.72}{0.0647}$	
Rel. response (% methane)	21.3	14.3	9.4
Ave. Rel. Resp. (% methane)		11.9	

Working Range

OVA 1	Meter Reading Corrected (MRC)	40 - 100
	2-Ethyl hexanol (approx. ppm)	500 - 1000
OVA 2	Meter Reading Corrected (MRC)	25 - 100
	2-Ethyl hexanol (approx. ppm)	500 - 1000

2-ETHYL HEXANOL $CH_3(CH_2)_3CH(C_2H_5)CH_2OH$ MW 130.2

TRIAL 1 OVA 3 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) 1.	Meter Reading Corrected (MRC) 2.
0	0.0	0.0
20	3.9	-0.7
40	18.0	11.2
60	16.0	8.2
80	31.0	26.2
100	22.0	13.2
500	36.0	43.2
1000	85.0	91.2

Reject: 20 - 100

	1.		2.
Slope	0.0850		0.0912
MRC intercept	- 2.17		- 0.80
Cor. coef.	0.9961		0.9995
Linear eqn. Conc. (ppm)	$\frac{MRC + 2.17}{0.0850}$		$\frac{MRC + 0.80}{0.0912}$
Ave. linear eqn. Conc. (ppm)		$\frac{MRC + 1.48}{0.0881}$	
Rel. response (% methane)	17.6		13.4
Ave. Rel. Resp. (% methane)		15.5	

Working Range

Meter Reading Corrected (MRC)	30 - 100
2-Ethyl hexanol (approx. ppm)	500 - 1000

ETHYLENE $CH_2=CH_2$ MW 28.05

TRIAL 1 OVA 1 and 2 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC)			
	OVA 1		OVA 2	
	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0
50	24.4	24.7	22.95	21.6
100	48.9	48.2	40.95	40.6
150	69.9	68.2	58.95	58.6
200	83.9	84.7	72.95	72.6
250	97.9	97.7	83.95	83.6
300	108.9	108.7	87.95	88.6

Accept all data

Slope	0.3634	0.3633	0.2999	0.3013
MRC intercept	7.34	7.25	7.40	7.04
Cor. coef.	0.9892	0.9896	0.9820	0.9839
Linear eqn. Conc. (ppm)	$\frac{MRC-7.34}{0.3634}$	$\frac{MRC-7.25}{0.3633}$	$\frac{MRC-7.40}{0.2999}$	$\frac{MRC-7.04}{0.3013}$
Ave. linear eqn. Conc. (ppm)	$\frac{MRC-7.30}{0.3633}$		$\frac{MRC-7.14}{0.3017}$	
Rel. response (% methane)	43.7	43.6	37.4	37.2
Ave. Rel. Resp. (% methane)	43.7		37.3	

Working Range

OVA 1	Meter Reading Corrected (MRC)	10 - 150
	Ethylene (approx. ppm)	10 - 300
OVA 2	Meter Reading Corrected (MRC)	10 - 100
	Ethylene (approx. ppm)	10 - 300

ETHYLENE $CH_2=CH_2$ MW 28.05

TRIAL 1 OVA 3 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)	
Std. (ppm)	1.	2.
0	0.0	0.0
50	23.0	23.2
100	44.0	43.2
150	63.0	63.2
200	78.0	78.2
250	89.0	89.2
300	94.0	94.2

Accept all data

	1.		2.
Slope	0.3200		0.3211
MRC intercept	7.86		7.71
Cor. coef.	0.9819		0.9823
Linear eqn. Conc. (ppm)	$\frac{MRC - 7.86}{0.3200}$		$\frac{MRC - 7.71}{0.3211}$
Ave. linear eqn. Conc. (ppm)		$\frac{MRC - 7.79}{0.3206}$	
Rel. response (% methane)	39.8		39.8
Ave. Rel. Resp. (% methane)		39.8	

Working Range

Meter Reading Corrected (MRC)	10 - 100
Ethylene (approx.(ppm)	10 - 300

ETHYLENE DIBROMIDE $BrCH_2CH_2Br$ MW 187.9

TRIAL 1 OVA 1 and 2 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)			
	OVA 1		OVA 2	
Std. (ppm)	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0
10	4.1	3.4	4.3	3.7
20	6.2	5.5	6.6	6.0
50	18.5	17.0	13.0	13.0
100	35.5	35.0	24.0	23.0
200	73.0	72.0	47.0	46.0
400	189.0	189.0	94.0	93.0

Accept all values

Slope	0.4638	0.4650	0.2314	0.2294
MRC intercept	-5.07	-5.82	1.20	0.82
Cor. coef.	0.9932	0.9928	0.9998	0.9998
Linear eqn. Conc. (ppm)	$\frac{MRC+5.07}{0.4638}$	$\frac{MRC+5.82}{0.4650}$	$\frac{MRC-1.20}{0.2314}$	$\frac{MRC-0.82}{0.2294}$
Ave. linear eqn. Conc. (ppm)	$\frac{MRC+5.41}{0.4643}$		$\frac{MRC-1.01}{0.2304}$	
Rel. response (% methane)	41.3	40.7	24.3	23.8
Ave. Rel. Resp. (% methane)	41.0		24.1	

Working Range

OVA 1	Meter Reading Corrected (MRC)	5 - 200
	Ethylene dibromide (approx. ppm)	10 - 400
OVA 2	Meter Reading Corrected (MRC)	10 - 150
	Ethylene dibromide (approx. ppm)	10 - 400

ETHYLENE DIBROMIDE $BrCH_2CH_2Br$ MW 187.9

TRIAL 1 OVA 3 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) 1.	Meter Reading Corrected (MRC) 2.
0	0.0	0.0
10	3.6	2.5
20	5.3	4.3
50	14.0	12.0
100	27.0	26.0
200	55.0	54.0
400	124.0	119.0

Accept all data

	1.	Average	2.
Slope	0.3064		0.2970
MRC intercept	- 1.44		- 1.98
Cor. coef.	0.9982		0.9988
Linear eqn. Conc. (ppm)	$\frac{MRC + 1.44}{0.3064}$		$\frac{MRC + 1.98}{0.2970}$
Ave. linear eqn. Conc. (ppm)		$\frac{MRC - 1.70}{0.3017}$	
Rel. response (% methane)	29.2		27.7
Ave. Rel. Resp. (% methane)		28.4	

Working Range

Meter Reading Corrected (MRC)	10 - 150
Ethylene dibromide (approx. ppm)	10 - 400

ETHYLENE DICHLORIDE $ClCH_2CH_2Cl$ MW 98.96

TRIAL 1 OVA 2 and 3 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)			
	OVA 2		OVA 3	
Std (ppm)	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0
2	2.5	2.55	4.1	4.6
4	4.1	4.15	6.2	5.8
6	6.2	6.4	9.5	9.5
8	12.0	12.3	14.5	15.0
10	14.0	15.8	18.5	19.0
20	19.0	19.8	24.5	24.5

Accept all data

Slope	0.9838	1.0540	1.2510	1.2531
MRC intercept	1.37	1.18	2.11	2.25
Cor. coef.	0.9570	0.9454	0.9619	0.9544
Linear eqn. Conc. (ppm)	$\frac{MRC-1.37}{0.9838}$	$\frac{MRC-1.18}{1.0540}$	$\frac{MRC-2.11}{1.2510}$	$\frac{MRC-2.25}{1.2531}$
Ave. linear eqn. Conc. (ppm)	$\frac{MRC-1.16}{1.0253}$		$\frac{MRC-2.20}{1.2518}$	
Rel. response (% methane)	95.0	99.0	122	122
Ave. Rel. Resp. (% methane)	97.0		122	

Working Range

OVA 2	Meter Reading Corrected (MRC)	0 - 25
	Ethylene dichloride (approx. ppm)	0 - 20
OVA 3	Meter Reading Corrected (MRC)	0 - 50
	Ethylene dichloride (approx. ppm)	0 - 20

ETHYLENE OXIDE $\overline{\mathrm{CH_2CH_2O}}$ MW 44.1

TRIAL 1 OVA 2 and 3 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) OVA 2	Meter Reading Corrected (MRC) OVA 3
8	0.0	0.0
10	5.0	4.8
20	9.0	8.3
100	26.5	24.0
400	76.0	67.8
800	148.0	135.8

Accept all data

	OVA 2	OVA 3
Slope	0.1804	0.1649
MRC intercept	4.09	3.57
Cor. coef.	0.9989	0.9988
Linear eqn. Conc. (ppm)	$\frac{MRC - 4.09}{0.1804}$	$\frac{MRC - 3.57}{0.1649}$
Ave. linear eqn. Conc. (ppm)		
Rel. response (% methane)	22.1	20.1
Ave. Rel. Resp. (% methane)		

Working Range

OVA 2	Meter Reading Corrected (MRC)	20 - 200
	Ethylene oxide (approx. ppm)	100 - 800
OVA 3	Meter Reading Corrected (MRC)	20 - 200
	Ethylene oxide (approx. ppm)	100 - 800

ETHYLENE OXIDE CH_2CH_2O MW 44.1

TRIAL 1 OVA 4 and 5 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)	
Std. (ppm)	OVA 4	OVA 5
8	0.0	0.0
10	5.3	5.1
20	9.3	9.1
100	26.3	26.1
400	79.3	94.6
800	164.3	172.6

Accept all data

	OVA 4	OVA 5
Slope	0.2072	0.2150
MRC intercept	4.54	3.27
Cor. coef.	0.9950	0.9986
Linear eqn. Conc. (ppm)	$\frac{MRC - 4.54}{0.2072}$	$\frac{MRC - 3.27}{0.2150}$
Ave. linear eqn. Conc. (ppm)		
Rel. response (% methane)	23.1	25.6
Ave. Rel. Resp. (% methane)		

Working Range

OVA 4 and 5	Meter Reading Corrected (MRC)	20 - 200
	Ethylene oxide (approx. ppm)	100 - 800

FORMALDEHYDE HCOH MW 30.0

TRIAL 1 OVA 1 and 2 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)			
	OVA 1		OVA 2	
Std. (ppm)	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0
200	10.0	7.4	7.6	7.5
400	15.0	15.6	10.0	10.7
600	21.0	21.6	14.0	13.7
800	29.0	28.6	18.5	18.2
1000	34.0	33.6	21.0	20.7

Accept all data

Slope	0.0333	0.0339	0.0202	0.0198
MRC intercept	1.52	0.83	1.73	1.90
Cor. coef.	0.9953	0.9975	0.9870	0.9852
Linear eqn. Conc. (ppm)	$\frac{MRC-1.52}{0.0333}$	$\frac{MRC-0.83}{0.0339}$	$\frac{MRC-1.73}{0.0202}$	$\frac{MRC-1.90}{0.0198}$
Ave. linear eqn. Conc. (ppm)	$\frac{MRC-1.18}{0.0336}$		$\frac{MRC-1.84}{0.0201}$	
Rel. response (% methane)	11.6	6.4	7.8	6.6
Ave. Rel. Resp. (% methane)	9.0		7.2	

Working Range

OVA 1	Meter Reading Corrected (MRC)	5 - 50
	Formaldehyde (approx. ppm)	100 - 1000
OVA 2	Meter Reading Corrected (MRC)	5 - 40
	Formaldehyde (approx. ppm)	100 - 1000

FORMALDEHYDE HCOH MW 30.0

TRIAL 1 OVA 3 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)	
Std. (ppm)	1.	2.
0	0.0	0.0
200	6.6	6.6
400	12.0	11.9
600	17.0	16.9
800	23.0	22.9
1000	26.0	25.9

Accept all data

	1.	2.
Slope	0.0263	0.0262
MRC intercept	0.94	0.93
Cor. coef.	0.9959	0.9960
Linear eqn. Conc. (ppm)	$\frac{MRC - 0.94}{0.0263}$	$\frac{MRC - 0.93}{0.0262}$

Ave. linear eqn. Conc. (ppm) $\frac{MRC - 0.94}{0.0262}$

Rel. response (% methane) 9.0 7.4

Ave. Rel. Resp. (% methane) 8.2

Working Range

Meter Reading Corrected (MRC)	5 - 40
Formaldehyde (approx. ppm)	100 - 1000

FORMIC ACID HCOOH MW 46.0

TRIAL 1 OVA 1, 2 and 3 MYLAR BAGS

Total volume: 44.0 liters

No response

n-HEXANE $CH_3(CH_2)_4CH_3$ MW 86.2

TRIAL 1 OVA 1 and 2 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)			
	OVA 1		OVA 2	
Std. (ppm)	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0
10	7.3	6.4	6.9	6.4
20	18.0	17.0	12.0	12.0
40	34.0	33.0	21.0	21.0
50	50.0	49.0	30.0	30.5
100	94.0	93.0	56.0	55.0
500	649.0	639.0	189.0	189.0

Reject 500 ppm data

	OVA 1 1.	OVA 1 2.	OVA 2 1.	OVA 2 2.
Slope	0.9549	0.9489	0.5560	0.5494
MRC intercept	-1.30	-1.73	0.60	0.67
Cor. coef.	0.9980	0.9978	0.9983	0.9976
Linear eqn. Conc. (ppm)	$\frac{MRC+1.30}{0.9549}$	$\frac{MRC+1.73}{0.9489}$	$\frac{MRC-0.60}{0.5560}$	$\frac{MRC-0.67}{0.5494}$
Ave. linear eqn. Conc. (ppm)	$\frac{MRC+1.41}{0.9517}$		$\frac{MRC-0.63}{0.5527}$	
Rel. response (% methane)	94.4	93.2	56.2	55.6
Ave. Rel. Resp. (% methane)	93.8		55.9	

Working Range

OVA 1	Meter Reading Corrected (MRC)	0 - 100
	n-hexane (approx. ppm)	0 - 100
OVA 2	Meter Reading Corrected (MRC)	0 - 75
	n-hexane (approx. ppm)	0 - 100

n-HEXANE $CH_3(CH_2)_4CH_3$ MW 86.2

TRIAL 1 OVA 3 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)	
Std. (ppm)	1.	2.
0	0.0	0.0
10	5.6	5.1
20	12.5	12.0
40	23.0	23.0
50	34.0	34.0
100	65.0	65.0

Accept all values

	1.	2.
Slope	0.6575	0.6598
MRC intercept	- 0.72	- 1.01
Cor. coef.	0.9981	0.9981
Linear eqn. Conc. (ppm)	$\frac{MRC + 0.72}{0.6575}$	$\frac{MRC + 1.01}{0.6598}$

Ave. linear eqn. Conc. (ppm) $\frac{MRC + 0.84}{0.6578}$

	1.	2.
Rel. response (% methane)	73.3	73.2

Ave. Rel. Resp. (% methane) 73.3

Working Range

Meter Reading Corrected (MRC)	0 - 100
n-hexane (approx. ppm)	0 - 100

HYDRAZINE H_2NNH_2 MW 32.05

TRIAL 1 OVA 1, 2 and 3 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 300 ppm

HYDROGEN H_2 MW 2.016

TRIAL 1 OVA 1, 2 and 3 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 100 ppm

HYDROGEN PEROXIDE H_2O_2 MW 34.0 (pure)

TRIAL 1 OVA 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 300 ppm

ISOBUTYRALDEHYDE $(CH_3)_2CHCHO$ MW 72.1 TRIAL 1 OVA 1,2 and 3

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)					
	OVA 1		OVA 2		OVA 3	
Std. (ppm)	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0
20	12.0	8.4	1.5	-	7.6	5.8
40	18.0	13.4	6.7	-	14.0	12.0
60	26.0	22.4	14.0	-	21.0	19.0
80	36.0	31.4	25.0	-	29.0	27.0
100	40.0	38.4	29.0	-	35.0	32.0
500	279.0	265.4	169.0	-	209.0	197.0
1000	619.0	600.4	329.0	-	479.0	457.0
Accept all data						
Slope	0.6184	0.6010	0.3349		0.4788	0.4543
MRC intercept	-10.39	-12.74	-3.57		-7.73	-8.50
Cor. coef.	0.9987	0.9984	0.9996		0.9982	0.9980
Linear Eqn. Conc. (ppm)	$\frac{MRC+10.39}{0.6184}$	$\frac{MRC+12.74}{0.6010}$	$\frac{MRC+3.57}{0.3349}$		$\frac{MRC+7.73}{0.4788}$	$\frac{MRC+8.50}{0.4543}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC+11.57}{0.6097}$		$\frac{MRC+3.57}{0.3349}$		$\frac{MRC+8.11}{0.4651}$	
Rel. response (% CH_4)	51.4	47.4	29.9		39.8	36.9
Ave. Rel. Resp. (% CH_4)	49.4		29.9		38.4	

Working Range

	OVA 1	OVA 2	OVA 3
Meter Reading Corrected (MRC)	5 - 700	0 - 400	5 - 500
Isobutyraldehyde (approx. ppm)	20 - 1000	20 - 1000	20 - 1000

ISOPROPANOL $CH_3CH(OH)CH_3$ MW 60.1 TRIAL 1 OVA 1,2 and 3 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)					
	OVA 1		OVA 2		OVA 3	
Std. (ppm)	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0
50	32.0	32.0	21.0	21.0	27.0	25.0
100	68.0	66.0	44.0	42.0	56.0	55.0
150	139.0	139.0	67.0	67.0	85.0	83.0
200	169.0	169.0	86.0	87.0	119.0	119.0
300	239.0	244.0	99.0	99.0	169.0	169.0
400	309.0	304.0	109.0	104.0	229.0	219.0
500	624.0	614.0	199.0	199.0	449.0	439.0
Accept all data						
Slope	1.0975	I.0828	0.3400	0.3367	0.7922	0.7726
MRC intercept	-35.73	-34.10	5.86	5.83	-26.58	-25.55
Cor. coef.	0.9530	0.9548	0.9619	0.9546	0.9549	0.9539
Linear eqn. Conc. (ppm)	$\frac{MRC+35.73}{1.0975}$	$\frac{MRC+34.10}{1.0828}$	$\frac{MRC-5.86}{0.3400}$	$\frac{MRC-5.83}{0.3367}$	$\frac{MRC+26.58}{0.7922}$	$\frac{MRC+25.55}{0.7726}$
Ave. lin. eqn. Co.(ppm)	$\frac{MRC+34.89}{1.0904}$		$\frac{MRC-5.85}{0.3384}$		$\frac{MRC+26.07}{0.7824}$	
Rel. response (% CH_4)	80.5	80.9	43.0	42.3	57.4	56.3
Ave. Rel. Resp. (% CH_4)	80.7		42.7		56.9	
Working Range						
Meter Reading Corrected (MRC)	25 - 700		0 - 250		0 - 500	
Isopropanol (approx. ppm)	50 - 500		25 - 500		25 - 500	

METHANOL CH_3OH MW 32.0 TRIAL 1 OVA 1, 2 and 3 MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)					
	OVA 1		OVA 2		OVA 3	
Std. (ppm)	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0
50	6.5	6.5	6.6	6.6	4.8	4.9
100	16.0	16.0	11.0	11.0	9.0	9.0
200	32.0	32.0	20.0	20.0	21.0	21.0
300	69.0	49.0	30.0	30.0	32.0	32.0
400	69.0	49.0	41.0	41.5	45.0	44.0
500	80.0	81.0	49.0	49.0	54.0	53.0
Accept all data						
Slope	0.1734	0.1672	0.0976	0.0981	0.1110	0.1076
MRC intercept	0.53	-0.81	0.90	0.87	-0.89	-0.12
Cor. coef.	0.9737	0.9988	0.9991	0.9988	0.9990	0.9996
Linear eqn. Conc. (ppm)	$\frac{MRC-0.53}{0.1734}$	$\frac{MRC+0.81}{0.1672}$	$\frac{MRC-0.90}{0.0976}$	$\frac{MRC-0.87}{0.0981}$	$\frac{MRC+0.89}{0.1110}$	$\frac{MRC+0.12}{0.1076}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC+0.06}{0.1696}$		$\frac{MRC-0.88}{0.0979}$		$\frac{MRC+0.49}{0.1092}$	
Rel. response (% CH_4)	15.9	15.9	10.6	10.7	10.2	10.6
Ave. Rel. Resp. (% CH_4)	15.9		10.7		10.4	
Working Range						
Meter Reading Corrected (MRC)	5 - 100		5 - 100		5 - 100	
Methanol (approx. ppm)	25 - 500		25 - 500		25 - 500	

METHYL ETHYL KETONE $CH_3CH_2COCH_3$ MW 72.1 TRIAL 1 OVA 1, 2 and 3

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)					
	OVA 1		OVA 2		OVA 3	
Std. (ppm)	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0
50	52.0	52.0	34.4	35.0	50.2	50.0
100	85.0	84.5	57.4	57.0	83.2	81.0
150	129.0	124.0	79.4	77.0	119.2	119.0
200	149.0	149.0	96.4	96.0	139.2	139.0
400	309.0	309.0	198.4	199.0	289.2	279.0
Accept all data						
Slope	0.7528	0.7528	0.4811	0.4820	0.7008	0.6765
MRC intercept	6.83	6.83	5.50	5.03	8.38	9.86
Cor. coef.	0.9982	0.9983	0.9978	0.9978	0.9974	0.9973
Linear eqn. Conc. (ppm)	$\frac{\text{MRC}-6.83}{0.7528}$	$\frac{\text{MRC}-6.83}{0.7528}$	$\frac{\text{MRC}-5.50}{0.4811}$	$\frac{\text{MRC}-5.03}{0.4820}$	$\frac{\text{MRC}-8.38}{0.7008}$	$\frac{\text{MRC}-9.86}{0.6765}$
Ave. lin. eqn. Co. (ppm)	$\frac{\text{MRC}-7.33}{0.7526}$		$\frac{\text{MRC}-5.27}{0.4816}$		$\frac{\text{MRC}-9.12}{0.6887}$	
Rel. response (% CH_4)	82.1	82.1	53.6	53.2	78.5	77.5
Ave. Rel. Resp. (% CH_4)	82.1		53.4		78.0	
Working Range						
Meter Reading Corrected (MRC)	40 - 400		30 - 250		40 - 350	
Methyl ethyl ketone (app. ppm)	40 - 400		40 - 400		40 - 400	

METHYL ISOBUTYL KETONE $CH_3(CH_2)_3COCH_3$ MW 100.2

TRIAL 1 OVA 2 and 3 MYLAR BAGS

Total volume:- 44.0 liters

	Meter Reading Corrected (MRC)			
	OVA 2		OVA 3	
Std. (ppm)	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0
20	12.0	12.0	18.0	18.0
40	9.0	8.0	13.0	13.0
60	26.0	25.0	37.0	37.0
80	25.0	24.0	37.0	38.0
100	78.0	78.0	113.0	118.0
200	78.0	76.0	113.0	108.0
500	198.0	193.0	328.0	328.0
1000	398.0	393.0	678.0	658.0

Accept data as-is

Slope	0.3939	0.3884	0.6744	0.6561
MRC intercept	3.80	3.35	-1.47	0.29
Cor. coef.	0.9944	0.9939	0.9960	0.9949
Linear eqn. Conc. (ppm)	$\frac{MRC-3.80}{0.3939}$	$\frac{MRC-3.35}{0.3884}$	$\frac{MRC+1.47}{0.6744}$	$\frac{MRC-0.29}{0.6561}$
Ave. linear eqn. Conc. (ppm)	$\frac{MRC-3.75}{0.3909}$		$\frac{MRC-0.57}{0.6644}$	
Rel. response (% methane)	43.2	42.2	66.0	65.9
Ave. Rel. Resp. (% methane)	42.7		66.0	

Working Range

OVA 2	Meter Reading Corrected (MRC)	50 - 500
	Methyl isobutyl ketone (app. ppm)	100 - 1000
OVA 3	Meter Reading Corrected (MRC)	100 - 750
	Methyl isobutyl ketone (app. ppm)	100 - 1000

METHYL METHACRYLATE $CH_2=C(CH_3)COOCH_3$ MW 100.1

TRIAL 1 OVA 2 and 3 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)			
	OVA 2		OVA 3	
Std. (ppm)	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0
20	10.8	10.6	10.9	9.8
40	18.8	18.6	19.9	18.3
60	30.8	29.6	30.4	28.8
80	41.8	40.8	41.4	38.8
100	52.3	50.6	50.9	48.3
200	97.2	95.6	96.6	94.8

Accept all data

	OVA 2, 1.	OVA 2, 2.	OVA 3, 1.	OVA 3, 2.
Slope	0.4889	0.4801	0.4830	0.4753
MRC intercept	1.03	0.82	1.23	0.17
Cor. coef.	0.9988	0.9992	0.9994	0.9999
Linear eqn. Conc. (ppm)	$\frac{MRC-1.03}{0.4889}$	$\frac{MRC-0.82}{0.4801}$	$\frac{MRC-1.23}{0.4830}$	$\frac{MRC-0.17}{0.4753}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-0.93}{0.4845}$		$\frac{MRC-0.71}{0.4790}$	
Rel. response (% methane)	49.9	47.5	49.5	47.7
Ave. Rel. Resp. (% CH_4)	48.7		48.6	

Working Range

OVA 2	Meter Reading Corrected (MRC)	5 - 150
	Methyl methacrylate (approx. ppm)	10 - 200
OVA 3	Meter Reading Corrected (MRC)	5 - 150
	Methyl methacrylate (approx. ppm)	10 - 200

METHYL METHACRYLATE $CH_2=C(CH_3)COOCH_3$ MW 100.1

TRIAL 1 OVA 4 and 5 MYLAR BAGS

Total volume: 44.0 liters

Std (ppm)	Meter Reading Corrected (MRC) OVA 4 1.	 OVA 4 2.	 OVA 5 1.	 OVA 5 2.
0	0.0	0.0	0.0	0.0
20	9.6	9.0	11.7	11.7
40	19.1	17.5	20.2	20.2
60	29.6	28.5	32.7	32.7
80	38.6	39.0	47.2	45.7
100	50.1	48.5	57.2	54.2
200	96.6	94.0	97.7	98.7

Accept all data

	OVA 4 1.	OVA 4 2.	OVA 5 1.	OVA 5 2.
Slope	0.4851	0.4743	0.4942	0.4953
MRC intercept	0.15	-0.09	2.80	2.22
Cor. coef.	0.9998	0.9995	0.9939	0.9972
Linear eqn. Conc. (ppm)	$\frac{MRC-0.15}{0.4851}$	$\frac{MRC+0.09}{0.4743}$	$\frac{MRC-2.80}{0.4942}$	$\frac{MRC-2.22}{0.4953}$
Ave. linear eqn. Conc. (ppm)	$\frac{MRC-0.04}{0.4797}$		$\frac{MRC-2.52}{0.4948}$	
Rel. response (%methane)	48.6	47.3	52.2	51.8
Ave. Rel. Resp. (% CH_4)	48.0		52.0	

Working Range

OVA 4	Meter Reading Corrected (MRC)	5 - 150
	Methyl methacrylate (approx. ppm)	10 - 200
OVA 5	Meter Reading Corrected (MRC)	5 - 150
	Methyl methacrylate (approx. ppm)	10 - 200

METHYLENE CHLORIDE CH_2Cl_2 MW 84.9 TRIAL 1 OVA 1, 2 and 3 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)					
	OVA 1		OVA 2		OVA 3	
Std. (ppm)	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0
20	28.0	32.0	24.0	24.1	29.0	29.0
40	69.0	75.0	52.0	51.1	68.0	67.0
60	67.0	72.0	51.0	50.1	62.0	62.0
80	75.0	82.0	59.0	58.1	71.0	70.0
100	86.0	94.0	72.0	66.1	79.0	79.0
200	179.0	179.0	119.0	118.1	149.0	149.0
500	479.0	489.0	269.0	258.1	399.0	379.0
1000	-	-	549.0	538.1	839.0	819.0
Accept all data						
Slope	0.9324	0.9430	0.5294	0.5175	0.8207	0.7968
MRC intercept	6.32	10.00	15.13	14.32	6.06	6.72
Cor. coef.	0.9964	0.9957	0.9986	0.9984	0.9983	0.9980
Linear eqn. Conc. (ppm)	$\frac{\text{MRC}-6.32}{0.9324}$	$\frac{\text{MRC}-10.00}{0.9430}$	$\frac{\text{MRC}-15.13}{0.5294}$	$\frac{\text{MRC}-14.32}{0.5175}$	$\frac{\text{MRC}-6.06}{0.8207}$	$\frac{\text{MRC}-6.72}{0.7968}$
Ave. lin. eqn. Co. (ppm)	$\frac{\text{MRC}-8.16}{0.9377}$		$\frac{\text{MRC}-14.75}{0.5235}$		$\frac{\text{MRC}-6.39}{0.8087}$	
Rel. response (% methane)	99.6	104.3	68.1	66.1	88.1	86.4
Ave. Rel. Resp. (% CH_4)	102.0		67.1		87.3	

Working Range	OVA 1	OVA 2	OVA 3
Meter Reading Corrected (MRC)	0 - 500	0 - 600	0 - 900
Methylene chloride (app. ppm)	0 - 500	0 - 1000	o - 1000

MONOMETHYLAMINE CH_3NH_2 MW 31.06

TRIAL 1 OVA 1, 2, 3, 4 and 5 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 20 ppm

MORPHOLINE C_4H_8ONH MW 87.1

TRIAL 1 OVA 2 and 3 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)	
Std. (ppm)	OVA 2	OVA 3
0	0.0	0.0
5	2.4	2.7
10	2.9	3.5
15	5.3	6.7
20	14.2	17.5

Accept all data

	OVA 2	OVA 3
Slope	0.6260	0.7800
MRC intercept	- 1.30	- 1.72
Cor. coef.	0.9002	0.9047
Linear eqn. Conc. (ppm)	$\frac{MRC + 1.30}{0.6260}$	$\frac{MRC + 1.72}{0.7800}$
Rel. response (% methane)	61.3	76.3

Working Range

OVA 2	Meter Reading Corrected (MRC)	0 - 25
	Morpholine (approx. ppm)	0 - 20
OVA 3	Meter Reading Corrected (MRC)	0 - 25
	Morpholine (approx. ppm)	0 - 20

NAPHTHA Composition variable MW approx. 125 TRIAL 1 OVA 1, 2 and 3

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)					
	OVA 1		OVA 2		OVA 3	
Std. (ppm)	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0
25	21.0	20.0	13.0	13.5	15.0	14.0
50	50.0	49.0	29.0	29.0	34.0	33.0
75	73.0	73.0	42.0	43.0	51.0	50.0
100	98.0	97.0	57.0	57.0	67.0	66.0
200	249.0	249.0	99.0	99.0	149.0	149.0
1000	-	-	419.0	409.0	929.0	929.0
Accept all data						
Slope	1.2510	1.2530	0.4126	0.4018	0.9408	0.9416
MRC intercept	-11.99	-12.64	8.67	9.69	-17.02	-17.76
Cor. coef.	0.9928	0.9924	0.9991	0.9988	0.9992	0.9992
Linear eqn. Conc. (ppm)	$\frac{MRC+11.99}{1.2510}$	$\frac{MRC+12.64}{1.2530}$	$\frac{MRC-8.67}{0.4126}$	$\frac{MRC-9.69}{0.4018}$	$\frac{MRC+17.02}{0.9408}$	$\frac{MRC+17.76}{0.9416}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC+12.32}{1.2520}$		$\frac{MRC-9.17}{0.4072}$		$\frac{MRC+17.39}{0.9412}$	
Rel. response (% CH_4)	113.1	112.6	49.9	49.9	77.1	76.4
Ave. Rel. Resp. (% CH_4)	113.0		49.9		76.8	

Working Range

	OVA 1	OVA 2	OVA 3
Meter Reading Corrected (MRC)	0 - 300	10 - 500	0 - 1000
Naphtha (approx. ppm)	0 - 200	20 - 1000	0 - 1000

PERCHLOROETHYLENE $Cl_2C=CCl_2$ MW 165.8

TRIAL 1 OVA 2 and 3 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)			
	OVA 2		OVA 3	
Std. (ppm)	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0
20	7.1	7.9	8.35	6.4
40	13.1	13.3	15.25	13.1
60	19.4	20.6	22.85	20.7
80	25.6	26.6	28.05	25.9
100	33.6	33.6	36.15	33.9
200	69.4	67.1	72.85	68.4

Accepts all data

Slope	0.3463	0.3331	0.3601	0.3427
MRC intercept	-0.71	0.37	0.49	-0.42
Cor. coef.	0.9993	0.9998	0.9995	0.9997
Linear eqn. Conc. (ppm)	$\frac{MRC+0.71}{0.3463}$	$\frac{MRC-0.37}{0.3331}$	$\frac{MRC-0.49}{0.3601}$	$\frac{MRC+0.42}{0.3427}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC+0.18}{0.3400}$		$\frac{MRC-0.04}{0.3513}$	
Rel. response (% methane)	33.9	33.7	36.5	33.8
Ave. Rel. Resp. (% methane)	33.8		35.2	

Working Range

OVA 2	Meter Reading Corrected (MRC)	0 - 100
	Perchloroethylene (approx. ppm)	0 - 200
OVA 3	Meter Reading Corrected (MRC)	0 - 100
	Perchloroethylene (approx. ppm)	0 - 200

PERCHLOROETHYLENE $Cl_2C=CCl_2$ MW 165.8

TRIAL 1 OVA 4 and 5 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC)			
	OVA 4		OVA 5	
	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0
20	8.3	7.6	8.7	7.5
40	14.0	13.0	14.9	14.0
60	22.0	20.3	22.7	20.2
80	27.7	26.3	28.7	27.0
100	35.8	33.8	36.9	35.0
200	71.3	66.8	73.9	70.0

Accept all data

Slope	0.3540	0.3328	0.3662	0.3490
MRC intercept	0.23	0.20	0.38	-0.12
Cor. coef.	0.9995	0.9998	0.9997	0.9997
Linear eqn. Conc. (ppm)	$\frac{MRC-0.23}{0.3540}$	$\frac{MRC-0.20}{0.3328}$	$\frac{MRC-0.38}{0.3662}$	$\frac{MRC+0.12}{0.3490}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-0.19}{0.3451}$		$\frac{MRC-0.16}{0.3574}$	
Rel. response (% methane)	35.7	33.5	37.0	34.8
Ave. Rel. Resp. (% CH_4)	34.6		35.9	

Working Range

OVA 4	Meter Reading Corrected (MRC)	0 - 100
	Perchloroethylene (approx. ppm)	0 - 200
OVA 5	Meter Reading Corrected (MRC)	0 - 100
	Perchloroethylene (approx. ppm)	0 - 200

PHOSPHORIC ACID H_3PO_4 MW 98.0

TRIAL 1 OVA 1, 2 and 3 MYLAR BAGS

Total volume: 44.0 liters

No response

PROPYLENE $CH_3CH=CH_2$ MW 42.1 TRIAL 1 OVA 1, 2 and 3 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)					
	OVA 1		OVA 2		OVA 3	
Std. (ppm)	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0
50	3.7	3.7	3.1	2.9	2.5	2.4
100	7.2	7.2	6.4	6.3	5.2	5.2
150	11.5	12.0	11.0	10.3	8.1	8.0
200	13.0	13.0	11.5	11.3	9.5	9.4
250	14.0	14.0	12.5	12.3	13.1	13.5
300	17.0	17.0	14.5	14.3	15.6	15.0
Accept all data						
Slope	0.0553	0.0553	0.0481	0.0476	0.0516	0.0510
MRC intercept	1.19	1.26	1.21	1.05	-0.03	0.00
Cor. coef.	0.9819	0.9770	0.9683	0.9755	0.9977	0.9960
Linear eqn. Conc. (ppm)	$\frac{\text{MRC}-1.19}{0.0553}$	$\frac{\text{MRC}-1.26}{0.0553}$	$\frac{\text{MRC}-1.21}{0.0481}$	$\frac{\text{MRC}-1.05}{0.0476}$	$\frac{\text{MRC}+0.03}{0.0516}$	$\frac{\text{MRC}-0.0}{0.0510}$
Ave. lin. eqn. Co. (ppm)	$\frac{\text{MRC}-1.24}{0.0553}$		$\frac{\text{MRC}-1.14}{0.0479}$		$\frac{\text{MRC}+0.01}{0.0513}$	
Rel. response (% CH_4)	6.7	6.8	6.0	5.8	5.1	5.1
Ave. Rel. Resp. (% CH_4)	6.75		5.9		5.1	
Working Range						
Meter Reading Corrected (MRC)	3 - 25		3 - 20		2 - 20	
Propylene (approx. ppm)	40 - 300		40 - 300		25 - 300	

PROPYLENE GLYCOL $CH_3CH(OH)CH_2OH$ MW 76.1

TRIAL 1 OVA 1, 2 and 3 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 1000 ppm

PROPYLENE OXIDE CH_3CHOCH_2 MW 58.1   TRIAL 1   OVA 1, 2 and 3   MYLAR BAGS

Total volume: 44.0 liters

Meter Reading Corrected (MRC)

Std. (ppm)	OVA 1		OVA 2		OVA 3	
	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0
5	3.7	2.9	2.7	3.2	2.9	2.4
10	6.8	6.1	6.1	6.8	6.0	5.5
15	8.7	7.8	8.3	8.9	7.8	7.2
20	14.0	13.0	9.0	9.0	11.0	10.0
30	19.5	20.0	14.0	14.0	18.0	17.0
40	26.5	27.0	18.0	19.0	24.0	23.0
50	31.0	30.0	20.0	20.0	26.0	25.0
Accept all data						
Slope	0.6317	0.6377	0.4020	0.4016	0.5511	0.5335
MRC intercept	0.35	-0.20	1.22	1.58	0.25	-0.07
Cor. coef.	0.9976	0.9946	0.9908	0.9846	0.9936	0.9937
Linear eqn. Conc. (ppm)	$\frac{MRC-0.35}{0.6317}$	$\frac{MRC+0.20}{0.6377}$	$\frac{MRC-1.22}{0.4020}$	$\frac{MRC-1.58}{0.4016}$	$\frac{MRC-0.25}{0.5511}$	$\frac{MRC+0.07}{0.5335}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-0.09}{0.6352}$		$\frac{MRC-1.43}{0.4012}$		$\frac{MRC-0.12}{0.5416}$	
Rel. response (% CH_4)	63.5	63.6	41.4	41.7	55.4	53.3
Ave. Rel. Resp. (% CH_4)	63.55		41.6		54.4	

Working Range

	OVA 1	OVA 2	OVA 3
Meter Reading Corrected (MRC)	0 - 50	2 - 25	0 - 50
Propylene Oxide (approx. ppm)	0 - 50	2 - 50	0 - 50

STYRENE MONOMER $C_6H_5CH{=}CH_2$ MW 104.2 TRIAL 1 OVA 1, 2 and 3

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)					
	OVA 1		OVA 2		OVA 3	
Std. (ppm)	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0
10	4.6	2.9	2.6	2.2	3.4	2.3
20	13.0	11.0	9.0	8.6	14.0	12.0
40	14.0	11.0	10.0	8.9	14.0	12.0
50	20.0	16.0	14.0	12.0	22.0	17.0
100	43.0	31.0	27.0	20.0	43.0	34.0
Accept all data						
Slope	0.4128	0.2989	0.2618	0.1920	0.4193	0.3304
MRC intercept	0.63	1.02	0.83	1.58	0.69	0.77
Cor. coef.	0.9868	0.9815	0.9872	0.9689	0.9834	0.9802
Linear eqn. Conc. (ppm)	$\frac{MRC-0.63}{0.4128}$	$\frac{MRC-1.02}{0.2989}$	$\frac{MRC-0.83}{0.2618}$	$\frac{MRC-1.58}{0.1920}$	$\frac{MRC-0.69}{0.4193}$	$\frac{MRC-0.77}{0.3304}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-0.84}{0.3557}$		$\frac{MRC-1.21}{0.2269}$		$\frac{MRC-0.75}{0.3746}$	
Rel. response (% CH_4)	41.9	30.9	27.0	20.8	42.6	33.8
Ave. Rel. Resp. (% CH_4)	36.4		23.9		38.2	
Working Range						
Meter Reading Corrected (MRC)	3 - 50		3 - 50		15 - 50	
Styrene monomer (approx. ppm)	5 - 100		10 - 100		40 - 100	

SULPHURYL CHLORIDE SO_2Cl_2 MW 135.0

TRIAL 1 OVA 1, 2 and 3 MYLAR BAGS

Total volume: 44.0 liters

No response

TETRAETHYL LEAD $(CH_3CH_2)_4Pb$ MW 323.4 (pure) TRIAL 1 OVA 1, 2 and 3

MYLAR BAGS Total volume: 44.0 liters MLA250 - DILUTE

	Meter Reading Corrected (MRC)					
	OVA 1		OVA 2		OVA 3	
Std. (ppm)	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0
1	6.35	6.2	4.4	4.2	4.9	5.0
5	27.55	27.9	19.3	20.0	28.8	29.3
10	52.05	50.9	34.8	33.5	51.3	51.8
15	82.55	79.9	54.8	52.5	80.3	79.8
20	115.55	107.4	69.8	65.5	100.8	100.8
25	137.55	132.4	88.7	84.5	136.8	136.8
Accept all data						
Slope	5.5826	5.2960	3.5099	3.3115	5.3155	5.3038
MRC intercept	-0.38	0.32	0.72	1.22	-0.15	0.06
Cor. coef.	0.9990	0.9997	0.9996	0.9988	0.9982	0.9982
Linear eqn. Conc. (ppm)	$\frac{MRC+0.38}{5.5826}$	$\frac{MRC-0.32}{5.2960}$	$\frac{MRC-0.72}{3.5099}$	$\frac{MRC-1.22}{3.3115}$	$\frac{MRC+0.15}{5.3155}$	$\frac{MRC-0.06}{5.3038}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC+0.03}{5.4399}$		$\frac{MRC-1.13}{3.4108}$		$\frac{MRC+0.01}{5.3085}$	
Rel. response (% CH_4)	557.9	529.9	351.7	332.4	531.4	530.4
Ave. Rel. Resp. (% CH_4)	543.9		342.0		530.9	
Working Range						
Meter Reading Corrected (MRC)	0 - 150		0 - 100		0 - 150	
Tetraethyl lead (appr. ppm)	0 - 25		0 - 25		0 - 25	

TETRAETHYL LEAD $(CH_3CH_2)_4Pb$ MW 323.4 (pure) TRIAL 1 OVA 1, 2 and 3

MYLAR BAGS Total volume: 44.0 liters MLA500

Meter Reading Corrected (MRC)

Std. (ppm)	OVA 1		OVA 2		OVA 3	
	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0
1	5.95	4.85	4.15	3.75	4.7	3.87
5	29.55	29.35	22.5	22.2	32.1	31.55
10	56.05	53.85	38.0	37.2	53.1	55.05
15	83.05	80.35	55.5	54.0	83.1	82.55
20	109.05	107.85	70.0	68.7	109.1	113.05
25	159.05	157.85	109.0	113.2	165.1	160.05
Accept all data						
Slope	6.0101	5.9644	4.0051	4.0917	6.1666	6.1160
MRC intercept	-2.01	-2.74	-0.75	-1.70	-3.07	-2.67
Cor. coef.	0.9940	0.9931	0.9884	0.9819	0.9901	0.9948
Linear eqn. Conc. (ppm)	$\frac{MRC+2.01}{6.0101}$	$\frac{MRC+2.74}{5.9644}$	$\frac{MRC+0.75}{4.0051}$	$\frac{MRC+1.70}{4.0917}$	$\frac{MRC+3.07}{6.1666}$	$\frac{MRC+2.67}{6.1160}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC+2.38}{5.9889}$		$\frac{MRC+1.19}{4.0482}$		$\frac{MRC+2.87}{6.1404}$	
Rel. response (% CH_4)	599.0	593.7	399.8	407.5	613.6	608.9
Ave. Rel. Resp. (% CH_4)	596.4		403.7		611.3	
Working Range						
Meter Reading Corrected (MRC)	0 - 200		0 - 150		0 - 200	
Tetraethyl lead (approx. ppm)	0 - 25		0 - 25		0 - 25	

TETRAETHYL LEAD $(CH_3CH_2)_4Pb$ MW 323.4 (pure) TRIAL 1 OVA 1, 2 and 3

MYLAR BAGS Total volume: 44.0 liters MLA750

	Meter Reading Corrected (MRC)					
	OVA 1		OVA 2		OVA 3	
Std. (ppm)	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0
1	5.75	5.45	4.2	4.05	4.65	4.55
5	32.85	32.65	22.9	23.0	34.9	33.95
10	65.35	64.15	43.9	43.0	66.4	65.45
15	105.35	100.15	65.9	65.0	108.4	103.45
20	120.35	118.15	93.9	90.0	120.4	118.45
25	178.35	176.15	128.4	128.0	179.4	178.45
Accept all data						
Slope	6.8150	6.6922	4.9638	4.8850	6.8619	6.7813
MRC intercept	-1.42	-1.70	-2.58	-2.60	-1.05	-1.58
Cor. coef.	0.9937	0.9937	0.9959	0.9943	0.9928	0.9928
Linear eqn. Conc. (ppm)	$\frac{MRC+1.42}{6.8150}$	$\frac{MRC+1.70}{6.6922}$	$\frac{MRC+2.58}{4.9638}$	$\frac{MRC+2.60}{4.8850}$	$\frac{MRC+1.05}{6.8619}$	$\frac{MRC+1.58}{6.7813}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC+1.55}{6.7555}$		$\frac{MRC+2.56}{4.9230}$		$\frac{MRC+1.31}{6.8222}$	
Rel. response (% CH_4)	680.1	667.5	493.8	485.9	685.1	676.6
Ave. Rel. Resp. (% CH_4)	673.8		489.9		680.9	

Working Range

	OVA 1	OVA 2	OVA 3
Meter Reading Corrected (MRC)	0 - 200	0 - 150	0 - 200
Tetraethyl lead (approx. ppm)	0 - 25	0 - 25	0 - 25

TETRAETHYL LEAD $(CH_3CH_2)_4Pb$ MW 323.4 (pure) TRIAL 1 OVA 1, 2 and 3

MYLAR BAGS Total volume: 44.0 liters

DILUTE GRAMS Pb BASIS

Meter Reading Corrected (MRC)

Std. (ppm)	OVA 1		OVA 2		OVA 3	
	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0
1	5.4	5.65	4.05	4.8	3.2	4.55
5	23.6	25.85	19.4	18.05	21.9	26.55
10	45.1	48.35	32.9	32.05	41.9	49.55
15	70.6	74.35	49.4	48.05	66.4	76.05
20	93.1	99.35	63.9	62.55	87.4	96.05
25	113.6	122.35	77.9	77.55	117.4	123.55
Accept all data						
Slope	4.5751	4.6414	3.1022	3.0629	4.6088	4.9057
MRC intercept	0.53	1.88	1.68	1.47	-1.72	0.57
Cor. coef.	0.9997	0.9972	0.9989	0.9996	0.9985	0.9997
Linear eqn. Conc. (ppm)	$\frac{MRC-0.53}{4.5751}$	$\frac{MRC-1.88}{4.6414}$	$\frac{MRC-1.68}{3.1022}$	$\frac{MRC-1.47}{3.0629}$	$\frac{MRC+1.72}{4.6088}$	$\frac{MRC-0.57}{4.9057}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-0.55}{4.7399}$		$\frac{MRC-1.56}{3.0942}$		$\frac{MRC+0.58}{4.7531}$	
Rel. response (% CH_4)	458.0	466.0	311.9	307.8	459.2	491.1
Ave. Rel. Resp. (% CH_4)	462.0		309.9		475.2	

Working Range

	OVA 1	OVA 2	OVA 3
Meter Reading Corrected (MRC)	0 - 150	0 - 100	0 - 150
Tetraethyl lead (approx. ppm)	0 - 25	0 - 25	0 - 25

TETRAETHYL LEAD $(CH_3CH_2)_4Pb$ MW 323.4 (pure) TRIAL 1 OVA1, 2 and 3

MYLAR BAGS Total volume: 44.0 liters MOTOR MIX

	Meter Reading Corrected (MRC)					
	OVA 1		OVA 2		OVA 3	
Std. (ppm)	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0
1	2.8	3.3	2.8	2.6	2.1	2.4
5	7.8	8.9	7.4	6.9	6.1	6.8
10	12.3	13.0	11.0	9.6	14.1	13.9
15	18.3	19.0	14.0	13.6	19.1	19.4
20	22.8	22.0	16.0	15.6	21.6	22.4
25	26.8	27.0	19.0	18.6	25.6	26.4
Accept all data						
Slope	1.0520	1.0273	0.7127	0.7039	1.0360	1.0586
MRC intercept	1.55	2.16	2.29	1.91	1.42	1.55
Cor. coef.	0.9955	0.9908	0.9780	0.9848	0.9870	0.9903
Linear eqn. Conc. (ppm)	$\frac{MRC-1.55}{1.0520}$	$\frac{MRC-2.16}{1.0273}$	$\frac{MRC-2.29}{0.7127}$	$\frac{MRC-1.91}{0.7039}$	$\frac{MRC-1.42}{1.0360}$	$\frac{MRC-1.55}{1.0586}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-1.90}{1.0385}$		$\frac{MRC-2.12}{0.7078}$		$\frac{MRC-1.52}{1.0458}$	
Rel. response (% CH_4)	106.7	104.9	73.6	72.3	104.9	107.4
Ave.Rel. Resp. (% CH_4)	105.8		73.0		106.2	
Working Range						
Meter Reading Corrected (MRC)	0 - 50		0 - 50		0 - 50	
Tetraethyl lead (approx. ppm)	0 - 25		0 - 25		0 - 25	

TETRAETHYL LEAD $(CH_3CH_2)_4Pb$ MW 323.4 (pure) TRIAL 1 OVA 1, 2 and 3

MYLAR BAGS Total volume: 44.0 liters

AVIATION MIX

	Meter Reading Corrected (MRC)								
	OVA 1			OVA 2			OVA 3		
Std. (ppm)	1.		2.	1.		2.	1.		2.
0	0.0		0.0	0.0		0.0	0.0		0.0
1	3.3		3.3	2.6		2.5	2.3		2.4
5	5.2		5.1	4.4		4.1	3.8		3.9
10	7.1		7.1	5.9		5.7	5.4		5.4
15	8.3		8.3	7.2		6.6	6.3		6.4
20	10.4		10.8	8.9		8.4	8.0		8.0
25	13.9		13.8	11.2		10.6	14.3		14.4
Accept all data									
Slope	0.4665		0.4716	0.3869		0.3640	0.4573		0.4578
MRC intercept	1.82		1.79	1.54		1.46	0.76		0.82
Cor. coef.	0.9727		0.9761	0.9761		0.9747	0.9512		0.9492
Linear eqn. Conc. (ppm)	$\frac{MRC-1.82}{0.4665}$		$\frac{MRC-1.79}{0.4716}$	$\frac{MRC-1.54}{0.3869}$		$\frac{MRC-1.46}{0.3640}$	$\frac{MRC-0.76}{0.4573}$		$\frac{MRC-0.82}{0.4578}$
Ave. lin. eqm. Co. (ppm)		$\frac{MRC-1.81}{0.4698}$			$\frac{MRC-1.53}{0.3749}$			$\frac{MRC-0.80}{0.4575}$	
Rel. response (% CH_4)	48.5		49.0	40.2		37.9	46.5		46.6
Ave. Rel. Resp. (% CH_4)		48.8			39.1			46.55	
Working Range									
Meter Reading Corrected (MRC)		0 - 25			0 - 25			0.- 25	
Tetraethyl lead (approx. ppm)		0 - 25			0 - 25			0 - 25	

TETRAETHYL LEAD $(CH_3CH_2)_4Pb$ MW 323.4 (pure) TRIAL 1 OVA 1, 2 and 3

MYLAR BAGS Total volume: 44.0 liters DILUTE VOLUME BASIS

	Meter Reading Corrected (MRC)					
	OVA 1		OVA 2		OVA 3	
Std. (ppm)	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0
1	6.25	6.5	4.2	4.55	4.75	5.08
5	23.2	23.5	16.15	17.6	23.95	24.08
10	43.2	43.5	28.7	29.1	43.95	44.58
15	65.2	64.0	42.15	42.1	64.45	64.58
20	80.7	78.0	51.7	51.6	78.95	79.08
25	115.2	115.5	68.15	68.6	113.45	116.58
Accept all data						
Slope	4.3617	4.3082	2.6333	2.6215	4.2998	4.3750
MRC intercept	0.32	0.44	1.56	2.03	0.39	0.21
Cor. coef.	0.9959	0.9934	0.9983	0.9973	0.9956	0.9939
Linear eqn. Conc. (ppm)	$\frac{MRC-0.32}{4.3617}$	$\frac{MRC-0.44}{4.3082}$	$\frac{MRC-1.56}{2.6333}$	$\frac{MRC-2.03}{2.6215}$	$\frac{MRC-0.39}{4.2998}$	$\frac{MRC-0.21}{4.3750}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-0.38}{4.3356}$		$\frac{MRC-1.82}{2.6274}$		$\frac{MRC-0.30}{4.3370}$	
Rel. response (% CH_4)	436.5	431.3	264.9	264.2	430.4	437.7
Ave. Rel. Resp. (% CH_4)	433.9		264.6		434.0	
Working Range						
Meter Reading Corrected (MRC)	0 - 150		0 - 100		0 - 150	
Tetraethyl lead (approx. ppm)	0 - 25		0 - 25		0 - 25	

TETRAMETHYLE LEAD $(CH_3)_4Pb$ MW 267.3 (pure) TRIAL 1 OVA 1, 2 and 3

MYLAR BAGS Total volume: 44.0 liters

TML DILUTE

Meter Reading Corrected (MRC)

Std. (ppm)	OVA 1		OVA 2		OVA 3	
	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0
1	7.1	6.7	5.1	4.5	5.85	5.4
5	27.0	26.3	19.7	19.0	29.35	27.6
10	56.0	54.3	37.7	37.0	59.35	59.1
15	80.0	79.3	54.7	55.0	83.35	85.6
20	119.0	118.3	75.7	75.0	118.35	117.6
25	139.0	148.3	108.7	108.0	158.35	157.6
Accept all data						
Slope	5.6442	5.8834	4.0992	4.0909	6.1476	6.1599
MRC intercept	-0.12	-1.99	-1.42	-1.75	-1.80	-2.18
Cor. coef.	0.9980	0.9978	0.9934	0.9938	0.9975	0.9982
Linear eqn. Conc. (ppm)	$\frac{MRC+0.12}{5.6442}$	$\frac{MRC+1.99}{5.8834}$	$\frac{MRC+1.42}{4.0992}$	$\frac{MRC+1.75}{4.0909}$	$\frac{MRC+1.80}{6.1476}$	$\frac{MRC+2.18}{6.1599}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC+1.04}{5.7657}$		$\frac{MRC+1.58}{4.0971}$		$\frac{MRC+2.00}{6.1552}$	
Rel. response (% CH_4)	564.3	586.3	408.5	407.3	613.0	613.8
Ave. Rel. Resp. (% CH_4)	575.3		407.9		613.4	
Working Range						
Meter Reading Corrected (MRC)	0 - 150		0 - 125		0 - 200	
Tetramethyl lead (approx. ppm)	0 - 25		0 - 25		0 - 25	

TOLUENE $C_6H_5CH_3$ MW 92.2

TRIAL 1 OVA 2 and 3 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)			
	OVA 2		OVA 3	
Std. (ppm)	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0
20	15.1	14.8	19.6	18.8
40	26.1	26.8	37.6	36.8
60	37.1	35.8	50.6	50.8
80	53.1	52.8	71.6	72.8
100	62.1	62.8	84.6	84.8
120	93.1	91.8	136.6	136.8

Accept all data

Slope	0.7148	0.7096	1.0246	1.0328
MRC intercept	-1.95	-1.89	-4.25	-4.71
Cor. coef.	0.9853	0.9869	0.9748	0.9748
Linear eqn. Conc. (ppm)	$\frac{MRC+1.95}{0.7148}$	$\frac{MRC+1.89}{0.7096}$	$\frac{MRC+4.25}{1.0246}$	$\frac{MRC+4.71}{L.0328}$
Ave. linear eqn. Conc. (ppm)	$\frac{MRC+1.89}{0.7125}$		$\frac{MRC+4.61}{1.0296}$	
Rel. response (% methane)	69.5	69.1	98.2	98.6
Ave. Rel. Resp. (% methane)	69.3		98.4	

Working Range

OVA 2	Meter Reading Corrected (MRC)	0 - 100
	Toluene (approx. ppm)	0 - 120
OVA 3	Meter Reading Corrected (MRC)	0 - 150
	Toluene (approx. ppm)	0 - 120

1.1.1-TRICHLOROETHANE CH_3CCl_3 MW 133.4 TRIAL 1 OVA 1, 2 and 3

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)					
	OVA 1		OVA 2		OVA 3	
Std. (ppm)	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0
50	46.5	43.0	36.5	39.4	41.0	35.0
100	79.0	77.0	59.0	59.4	69.0	65.0
150	149.0	149.0	77.0	77.4	99.0	94.0
200	189.0	189.0	97.0	94.4	144.0	139.0
250	244.0	229.0	114.0	101.4	169.0	169.0
300	279.0	269.0	119.0	116.4	219.0	199.0
350	324.0	309.0	139.0	137.4	239.0	229.0
700	659.0	629.0	264.0	257.4	499.0	459.0
1000	919.0	899.0	369.0	359.4	699.0	669.0

Reject 300 ppm data for OVA 2

	OVA 1 1.	OVA 1 2.	OVA 2 1.	OVA 2 2.	OVA 3 1.	OVA 3 2.
Slope	0.9253	0.8982	0.3529	0.3425	0.7023	0.6650
MRC intercept	2.01	0.84	18.61	18.57	0.09	-0.36
Cor. coef.	0.9996	0.9996	0.9976	0.9975	0.9996	0.9998
Linear eqn. Conc. (ppm)	$\frac{MRC-2.01}{0.9253}$	$\frac{MRC-0.84}{0.8982}$	$\frac{MRC-18.61}{0.3529}$	$\frac{MRC-18.57}{0.3425}$	$\frac{MRC-0.09}{0.7023}$	$\frac{MRC+0.36}{0.6650}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-1.31}{0.9118}$		$\frac{MRC-19.13}{0.3445}$		$\frac{MRC+0.14}{0.6837}$	
Rel. response (% methane)	94.5	90.7	53.9	52.8	70.3	66.1
Ave. Rel. Resp. (% CH_4)	92.6		53.4		68.2	

Working Range

	OVA 1	OVA 2	OVA 3
Meter Reading Corrected (MRC)	0 - 1000	100 - 400	0 - 700
1,1,1-Trichloroethane (app. ppm)	0 - 1000	200 - 1000	0 - 1000

1,1,1-TRICHLOROETHANE CH_3CCl_3 MW 133.4

TRIAL 1 OVA 4 and 5 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)			
	OVA 4		OVA 5	
Std. (ppm)	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0
50	39.6	39.7	48.5	46.5
100	69.1	69.2	89.0	79.0
150	84.1	84.2	99.0	99.0
200	101.1	104.2	119.0	117.0
250	119.1	121.2	139.0	139.0
300	129.1	131.2	139.0	129.0
350	159.1	159.2	174.0	179.0
700	304.1	301.2	344.0	339.0
1000	429.1	419.2	489.2	474.0

Reject 300 ppm data OVA 4 and 5

Slope	0.4131	0.4034	0.4646	0.4541
MRC intercept	16.52	18.72	22.31	22.35
Cor. coef.	0.9985	0.9982	0.9971	0.9980
Linear eqn. Conc. (ppm)	$\frac{MRC-16.52}{0.4131}$	$\frac{MRC-18.72}{0.4034}$	$\frac{MRC-22.31}{0.4646}$	$\frac{MRC-22.35}{0.4541}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-17.53}{0.4089}$		$\frac{MRC-22.33}{0.4593}$	
Rel. response (% CH_4)	57.8	59.1	68.8	67.8
Ave. Rel. Resp. (% CH_4)	58.4		68.3	

Working Range

OVA 4	Meter Reading Corrected (MRC)	0 - 500
	1,1,1-Trichloroethane (appr. ppm)	0 - 1000
OVA 5	Meter Reading Corrected (MRC)	0 - 500
	1,1,1-Trichloroethane (appr. ppm)	0 - 1000

TRIMETHYLAMINE $(CH_3)_3N$ MW 59.1

TRIAL 1 OVA 1, 2, 3, 4 and 5 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 20 ppm

TURPENTINE mainly $C_{10}H_{16}$ MW approx. 136 TRIAL 1 OVA 1, 2 and 3

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)					
	OVA 1		OVA 2		OVA 3	
Std. (ppm)	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0
50	20.0	19.0	12.0	13.0	13.0	12.0
100	34.0	33.0	21.0	21.0	22.0	22.0
200	65.0	63.0	39.0	38.0	44.0	43.0
500	219.0	209.0	89.0	98.0	129.0	129.0
1000	489.0	489.0	159.0	149.0	289.0	289.0
2000	639.0	639.0	199.0	189.0	399.0	399.0
Reject 2000 ppm data all OVA unit tests						
Slope	0.4930	0.4913	0.1574	0.1502	0.2894	0.2900
MRC intercept	-14.17	-15.99	4.76	6.84	-6.42	-6.90
Cor. coef.	0.9973	0.9962	0.9980	0.9889	0.9980	0.9980
Linear eqn. Conc. (ppm)	$\frac{MRC+14.17}{0.4930}$	$\frac{MRC+15.99}{0.4913}$	$\frac{MRC-4.76}{0.1574}$	$\frac{MRC-6.84}{0.1502}$	$\frac{MRC+6.42}{0.2894}$	$\frac{MRC+6.90}{0.2900}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC+15.08}{0.4921}$		$\frac{MRC-5.79}{0.1539}$		$\frac{MRC+6.66}{0.2897}$	
Rel. response (% CH_4)	35.1	33.1	20.5	21.9	22.5	22.1
Ave. Rel. Resp. (% CH_4)	34.1		21.2		22.3	
Working Range						
Meter Reading Corrected (MRC)	10 - 500		10 - 200		10 - 350	
Turpentine (approx. ppm)	25 - 1000		40 - 1000		40 - 1000	

VINYL ACETATE $CH_3CO_2CH=CH_2$ MW 86.05 TRIAL 1 OVA 1, 2 and 3

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)					
	OVA 1		OVA 2		OVA 3	
Std. (ppm)	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0
5	2.6	2.3	2.0	1.9	1.9	1.7
10	1.6	1.3	1.1	1.2	1.2	1.0
20	2.2	2.0	1.6	1.7	1.7	1.5
50	6.7	6.4	4.3	4.4	5.2	5.0
100	7.0	6.9	4.8	4.9	5.7	5.5
250	15.0	14.0	11.0	11.0	14.0	14.0
Accept all data						
Slope	0.0552	0.0523	0.0404	0.0403	0.0524	0.0529
MRC intercept	1.58	1.46	1.04	1.08	0.99	0.81
Cor. coef.	0.9700	0.9678	0.9787	0.9789	0.9838	0.9854
Linear eqn. Conc. (ppm)	$\frac{MRC-1.58}{0.0552}$	$\frac{MRC-1.46}{0.0523}$	$\frac{MRC-1.04}{0.0404}$	$\frac{MRC-1.08}{0.0403}$	$\frac{MRC-0.99}{0.0524}$	$\frac{MRC-0.81}{0.0529}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-1.55}{0.0536}$		$\frac{MRC-1.06}{0.0403}$		$\frac{MRC-0.90}{0.0526}$	
Rel. response (% CH_4)	7.1	6.7	5.1	5.1	6.2	6.1
Ave. Rel. Resp. (% CH_4)	6.9		5.1		6.15	
Working Range						
Meter Reading Corrected (MRC)	3 - 20		1.5 - 20		1.5 - 20	
Vinyl acetate (approx. ppm)	20 - 250		20 - 250		20 - 250	

VINYL CHLORIDE CH_2=CHCl MW 62.05

TRIAL 1 OVA 1, 2, 3, 4 and 5 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 25 ppm

o-XYLENES $C_6H_5(CH_3)_2$ MW 106.2

TRIAL 1 OVA 1 MYLAR BAGS

Total volume: 44.0 liters

Std. (ppm)	Meter Reading Corrected (MRC) 1.	Meter Reading Corrected (MRC) 2.
0	0.0	0.0
20	10.8	5.7
40	21.5	17.5
60	32.5	27.0
80	55.2	50.0
100	62.5	53.0
200	104.0	96.5
500	239.0	214.5

Accept all data

	1.	2.
Slope	0.4722	0.4292
MRC intercept	6.66	4.38
Cor. coef.	0.9963	0.9954
Linear eqn. Conc. (ppm)	$\frac{MRC-6.66}{0.4722}$	$\frac{MRC-4.38}{0.4292}$
Ave. linear eqn. Conc. (ppm)	$\frac{MRC-5.54}{0.4508}$	
Rel. response (% methane)	53.9	47.3
Ave. Rel. Resp. (% methane)	50.5	

Working Range

Meter Reading Corrected (MRC)	40 - 300
o-Xylenes (approx. ppm)	60 - 500

APPENDIX D

EXPERIMENTAL RESULTS IN THE CALIBRATION OF HNU UNITS

GENERAL

The following points should be noted.

1. Each set of trials carries an indication of the HNU unit involved by an identifying number. The HNU units are actually interchangeable, so that these numbers were solely for record purposes in the event of unit failure.

2. The corrected meter reading values (1) and (2) represent tests carried out at (1) equilibration and (2) 30 minutes after test (1).

3. The linear equation for each test set is given, together with the corresponding corelation coefficient. An average linear equation is also provided.

4. The response factor, relative to benzene, is given as a percentage value for each test set. An average response factor is also provided.

ACETIC ACID CH_3COOH MW 60.0

TRIAL 1 HNU 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

ACETIC ANHYDRIDE $(CH_3CO)_2O$ MW 102.1 TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100	9.5	10.8	10.8	9.6	10.7	10.1	13.1	11.0
500	19.2	19.6	19.6	21.6	18.8	21.7	21.5	20.0
1000	26.6	25.6	25.6	29.6	25.8	29.7	31.5	31.0
Accept all data								
Slope	0.0242	0.0227	0.0227	0.0267	0.0228	0.0274	0.0276	0.0279
MRC intercept	4.13	4.92	4.92	3.28	4.70	4.43	5.48	4.34
Cor. coef.	0.9521	0.9268	0.9269	0.9731	0.9354	0.9543	0.9411	0.9626
Linear eqn. Conc. (ppm)	$\frac{MRC-4.13}{0.0242}$	$\frac{MRC-4.92}{0.0227}$	$\frac{MRC-4.92}{0.0227}$	$\frac{MRC-3.28}{0.0267}$	$\frac{MRC-4.70}{0.0228}$	$\frac{MRC-4.43}{0.0274}$	$\frac{MRC-5.48}{0.0276}$	$\frac{MRC-4.34}{0.0279}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-4.54}{0.0235}$		$\frac{MRC-4.56}{0.0251}$		$\frac{MRC-4.57}{0.0251}$		$\frac{MRC-4.91}{0.0278}$	
Rel. response (% C_6H_6)	7.5	7.1	8.1	8.0	7.9	8.3	9.4	10.1
Ave. Rel. Resp. (% C_6H_6)	7.3		8.05		8.1		9.75	
Working Range								
Meter Reading Corrected (MRC)	0 - 35		0 - 35		0 - 35		0 - 35	
Acetic anhydride (Appr. ppm)	10 - 1000		10 - 1000		10 - 1000		10 - 1000	

ACETONE CH_3COCH_3 MW 58.1   TRIAL 1   HNU 1, 2, 3 and 4   MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
150	64.0	59.2	72.0	65.0	55.8	55.6	55.8	51.6
300	115.0	113.2	131.0	119.0	113.8	102.6	103.8	97.6
450	153.0	153.2	174.0	164.0	143.8	135.6	149.8	139.6
600	179.0	180.2	207.0	197.0	180.8	170.6	187.8	171.6
750	194.0	217.2	237.0	227.0	197.8	190.6	207.8	193.6
900	198.0	217.6	197.0	197.0	149.8	153.6	147.8	161.6

Reject 900 ppm data all tests

	HNU 1		HNU 2		HNU 3		HNU 4	
	1.	2.	1.	2.	1.	2.	1.	2.
Slope	0.2577	0.2836	0.3110	0.3002	0.2655	0.2535	0.2821	0.2610
MRC intercept	20.86	14.14	20.19	16.10	15.76	14.10	11.71	11.14
Cor. coef.	0.9739	0.9900	0.9846	0.9888	0.9827	0.9879	0.9904	0.9907
Linear eqn. Conc. (ppm)	$\frac{MRC-20.86}{0.2577}$	$\frac{MRC-14.14}{0.2836}$	$\frac{MRC-20.19}{0.3110}$	$\frac{MRC-16.10}{0.3002}$	$\frac{MRC-15.76}{0.2655}$	$\frac{MRC-14.10}{0.2535}$	$\frac{MRC-11.71}{0.2821}$	$\frac{MRC-11.14}{0.2610}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-17.48}{0.2709}$		$\frac{MRC-18.14}{0.3056}$		$\frac{MRC-14.93}{0.2595}$		$\frac{MRC-11.45}{0.2715}$	
Rel. response (% C_6H_6)	42.6	40.6	48.0	43.3	38.9	36.7	36.8	34.6
Ave. Rel. Resp. (% C_6H_6)	41.9		45.7		37.8		35.7	

Working Range

	HNU 1	HNU 2	HNU 3	HNU 4
Meter Reading Corrected (MRC)	0 - 250	0 - 250	0 - 250	0 - 250
Acetone (approx. ppm)	25 - 750	25 - 750	25 - 750	25 - 750

ACRYLONITRILE CH_2=CHCN MW 53.1

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 4000 ppm

ARSINE AsH_3 MW 77.95

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: pue gas

BENZENE C_6H_6 MW 78.1 TRIAL 1 HNU 1, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0			0.0	0.0	0.0	0.0
2	1.6	0.3			1.8	0.45	1.6	0.5
4	4.4	3.2			4.4	3.2	4.7	3.9
6	6.9	5.8			7.15	5.75	7.7	6.5
8	8.0	6.4			8.0	6.5	8.4	6.9
10	9.05	7.1			9.25	7.25	9.5	7.9
20	17.9	17.1			18.9	17.3	19.9	16.3
100	68.9	68.1			76.9	71.8	73.9	73.4
500	212.9	211.1			247.9	216.3	212.9	226.4

Reject 500 ppm data all tests

	HNU 1 1.	HNU 1 2.	HNU 2 1.	HNU 2 2.	HNU 3 1.	HNU 3 2.	HNU 4 1.	HNU 4 2.
Slope	0.6757	0.6785			0.7581	0.7165	0.7251	0.7290
MRC intercept	1.92	0.78			1.59	0.60	2.12	0.76
Cor. coef.	0.9980	0.9982			0.9989	0.9988	0.9974	0.9992
Linear eqn. Conc. (ppm)	$\frac{MRC-1.92}{0.6757}$	$\frac{MRC-0.78}{0.6785}$			$\frac{MRC-1.59}{0.7581}$	$\frac{MRC-0.60}{0.7165}$	$\frac{MRC-2.12}{0.7251}$	$\frac{MRC-0.76}{0.7290}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-1.37}{0.6769}$				$\frac{MRC-1.13}{0.7373}$		$\frac{MRC-1.44}{0.7275}$	
Rel. response (% C_6H_6)	67.0	67.3			75.3	71.4	71.8	72.6
Ave. Rel. Resp. (% C_6H_6)	67.2				73.3		72.3	

Working Range

	HNU 1	HNU 2	HNU 3	HNU 4
Meter Reading Corrected (MRC)	3 - 100		3 - 100	3 - 100
Benzene (approx. ppm)	2 - 100		2 - 100	2 - 100

1,3-BUTADIENE $CH_2=CHCH=CH_2$ MW 54.1 TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
200	61.0	78.7	93.9		93.2	78.5	93.7	83.9
400	249.5	243.7	348.9		264.2	238.5	289.2	278.9
600	319.5	318.7	488.9		354.2	313.5	377.2	378.9
800	329.5	328.7	498.9		359.2	328.5	379.2	388.9

Reject 800 ppm data all tests

	HNU 1		HNU 2		HNU 3		HNU 4	
Slope	0.5735	0.5606	0.8608		0.6168	0.5502	0.6636	0.6659
MRC intercept	-14.55	- 7.89	-25.33		-7.14	-7.45	-9.04	-14.33
Cor. coef.	0.9776	0.9878	0.9857		0.9918	0.9887	0.9877	0.9879
Linear eqn. Conc. (ppm)	$\frac{MRC+14.55}{0.5735}$	$\frac{MRC+7.89}{0.5606}$	$\frac{MRC+25.33}{0.8608}$		$\frac{MRC+7.14}{0.6168}$	$\frac{MRC+7.45}{0.5502}$	$\frac{MRC+9.04}{0.6636}$	$\frac{MRC+14.33}{0.6659}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC+11.20}{0.5670}$		$\frac{MRC+25.33}{0.8608}$		$\frac{MRC+7.28}{0.5836}$		$\frac{MRC+11.69}{0.6648}$	
Rel. response (% C_6H_6)	65.9	62.9	93.6		67.8	61.5	74.6	73.3
Ave. Rel. Resp. (% C_6H_6)	63.7		93.6		64.7		73.9	
Working Range								
Meter Reading Corrected (MRC)	50 - 400		50 - 500		50 - 400		50 - 400	
1,3-Butadiene (approx. ppm)	100 - 600		100 - 600		100 - 600		100 - 600	

BUTANOL $CH_3(CH_2)_3OH$ MW 74.1 TRIAL 1 HNU 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0			0.0	0.0	0.0	0.0	0.0	0.0
10			0.1	0.2	0.7	0.5	1.65	0.4
20			1.4	1.6	1.4	6.0	3.1	3.2
30			6.9	6.4	8.4	6.9	12.5	10.7
40			10.6	10.6	12.0	11.3	17.0	14.2
50			14.4	16.3	16.0	16.2	25.5	25.2
100			16.4	16.3	17.5	16.7	27.0	27.2
Reject 100 ppm data all tests								
Slope			0.3114	0.3357	0.3454	0.3266	0.5227	0.5040
MRC intercept			-2.22	-2.54	-2.22	-1.35	-3.11	-3.60
Cor. coef.			0.9621	0.9550	0.9613	0.9778	0.9656	0.9517
Linear eqn. Conc. (ppm)			$\frac{MRC+2.22}{0.3114}$	$\frac{MRC+2.54}{0.3357}$	$\frac{MRC+2.22}{0.3454}$	$\frac{MRC+1.35}{0.3266}$	$\frac{MRC+3.11}{0.5227}$	$\frac{MRC+3.60}{0.5040}$
Ave. lin. eqn. Co. (ppm)			$\frac{MRC+2.37}{0.3240}$		$\frac{MRC+1.78}{0.3366}$		$\frac{MRC+3.35}{0.5121}$	
Rel. response (% C_6H_6)			33.2	37.7	36.4	35.1	57.2	57.6
Ave. Rel. Resp. (% C_6H_6)			37.5		35.8		57.5	
Working Range								
Meter Reading Corrected (MRC)			1 - 25		1 - 25		1 - 25	
Butanol (approx. ppm)			10 - 50		10 - 50		10 - 50	

BUTYLENE $CH_3CH_2CH=CH_2$ MW 56.1 TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.3 liters

Meter Reading Corrected (MRC)

	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
250	118.3	120.1	149.8	152.1	135.0	140.5	392.6	400.0
500	244.5	255.7	359.1	360.15	274.2	277.1	819.4	817.95
1000	364.5	367.7	577.1	578.15	424.2	419.1	1264.4	1307.95
5000	399.5	402.7	769.1	783.15	514.2	504.1	1489.4	1607.95

Reject 5000 ppm data all tests

	HNU 1 1.	HNU 1 2.	HNU 2 1.	HNU 2 2.	HNU 3 1.	HNU 3 2.	HNU 4 1.	HNU 4 2.
Slope	0.3623	0.3662	0.5833	0.5837	0.4214	0.4146	1.2596	1.3017
MRC intercept	23.32	25.64	16.32	17.24	24.00	27.80	68.04	62.00
Cor. coef.	0.9823	0.9773	0.9906	0.9906	0.9868	0.9836	0.9867	0.9903
Linear eqn. Conc. (ppm)	$\frac{MRC-23.32}{0.3623}$	$\frac{MRC-25.64}{0.3662}$	$\frac{MRC-16.32}{0.5833}$	$\frac{MRC-17.24}{0.5837}$	$\frac{MRC-24.0}{0.4214}$	$\frac{MRC-27.8}{0.4146}$	$\frac{MRC-68.04}{1.2596}$	$\frac{MRC-62.0}{1.3017}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-24.48}{0.3643}$		$\frac{MRC-16.80}{0.5834}$		$\frac{MRC-25.92}{0.4180}$		$\frac{MRC-65.02}{1.2806}$	
Rel. response (% C_6H_6)	44.2	46.0	68.6	68.6	50.0	50.0	150.3	151.2
Ave. Rel. Resp. (% C_6H_6)	45.1		68.6		50.0		150.7	

Working Range

	HNU 1	HNU 2	HNU 3	HNU 4
Meter Reading Corrected (MRC)	0 - 400	0 - 600	0 - 500	0 - 1500
Butylene (approx. ppm)	0 - 1000	0 - 1000	0 - 1000	0 - 1000

BUTYRALDEHYDE $CH_3(CH_2)_2CHO$ MW 72.1 TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	3.8	2.8	3.9	2.3	3.1	2.5	3.0	2.8
40	12.0	10.3	10.8	10.7	9.5	9.0	9.0	10.1
60	16.0	14.0	15.1	14.9	12.8	12.1	13.4	12.1
80	22.4	19.0	20.5	19.7	17.2	16.2	18.2	17.2
100	33.4	31.0	31.5	31.7	25.2	25.2	27.2	27.2
500	123.4	118.0	130.5	126.7	100.2	99.2	103.2	100.2
1000	181.4	178.0	206.5	206.7	160.2	159.2	156.2	155.2

Reject 1000 ppm data all tests

	HNU 1		HNU 2		HNU 3		HNU 4	
	1.	2.	1.	2.	1.	2.	1.	2.
Slope	0.2450	0.2361	0.2614	0.2543	0.1994	0.1982	0.2055	0.1994
MRC intercept	2.15	0.89	0.46	0.36	1.21	0.81	1.37	1.44
Cor. coef.	0.9971	0.9974	0.9988	0.9980	0.9984	0.9980	0.9976	0.9968
Linear eqn. Conc. (ppm)	$\frac{MRC-2.15}{0.2450}$	$\frac{MRC-0.89}{0.2361}$	$\frac{MRC-0.46}{0.2614}$	$\frac{MRC-0.36}{0.2543}$	$\frac{MRC-1.21}{0.1994}$	$\frac{MRC-0.81}{0.1982}$	$\frac{MRC-1.37}{0.2055}$	$\frac{MRC-1.44}{0.1994}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-1.51}{0.2409}$		$\frac{MRC-0.42}{0.2578}$		$\frac{MRC-1.03}{0.1988}$		$\frac{MRC-1.42}{0.2024}$	
Rel. response (% C_6H_6)	31.3	30.1	31.0	31.3	24.0	24.4	25.8	25.8
Ave. Rel. Resp. (% C_6H_6)	30.7		31.2		24.2		25.8	

Working Range

	HNU 1	HNU 2	HNU 3	HNU 4
Meter Reading Corrected (MRC)	5 - 150	5 - 150	5 - 150	5 - 150
Butyraldehyde (approx. ppm)	10 - 500	10 - 500	10 - 500	10 - 500

ISOBUTYRALDEHYDE $(CH_3)_2CHCHO$ MW 72.1 TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	5.4	4.2	4.0	4.5	3.9	4.1	4.6	4.3
40	14.5	12.1	12.4	12.7	10.5	8.8	11.2	11.5
60	24.2	21.8	21.8	21.9	17.6	18.3	20.0	18.7
80	34.2	30.8	31.8	30.9	24.6	24.3	27.0	26.7
100	38.2	33.8	36.8	33.9	30.6	27.3	33.0	30.7
500	154.2	147.8	151.8	154.9	122.6	124.3	124.0	119.7
1000	218.2	215.8	245.8	236.9	190.6	194.3	181.0	176.7

Reject 1000 ppm data all tests

	HNU 1		HNU 2		HNU 3		HNU 4	
	1.	2.	1.	2.	1.	2.	1.	2.
Slope	0.3038	0.2935	0.3016	0.3082	0.2431	0.2475	0.2417	0.2356
MRC intercept	3.95	2.25	2.48	1.75	2.18	1.30	3.72	3.30
Cor. coef.	0.9971	0.9981	0.9976	0.9988	0.9979	0.9987	0.9956	0.9968
Linear eqn. Conc. (ppm)	$\frac{MRC-3.95}{0.3038}$	$\frac{MRC-2.25}{0.2935}$	$\frac{MRC-2.48}{0.3016}$	$\frac{MRC-1.75}{0.3082}$	$\frac{MRC-2.18}{0.2431}$	$\frac{MRC-1.30}{0.2475}$	$\frac{MRC-3.72}{0.2417}$	$\frac{MRC-3.30}{0.2356}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-3.10}{0.2986}$		$\frac{MRC-2.15}{0.3049}$		$\frac{MRC-1.77}{0.2454}$		$\frac{MRC-3.44}{0.2399}$	
Rel. response (% C_6H_6)	34.3	31.6	34.3	32.2	28.4	26.0	29.3	27.4
Ave. Rel. Resp. (% C_6H_6)	32.9		33.3		27.2		28.5	

Working Range

	HNU 1	HNU 2	HNU 3	HNU 4
Meter Reading Corrected (MRC)	10 - 200	10 - 200	10 - 200	10 - 200
Isobutyraldehyde (appr. ppm)	20 - 500	20 - 500	20 - 500	20 - 500

CARBON DIOXIDE CO_2 MW 44.0

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

CARBON DISULPHIDE CS_2 MW 76.14 TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	2.8	2.3	2.3	2.3	2.3	2.1	2.5	2.7
20	5.4	4.4	4.9	5.0	5.6	4.4	5.3	5.5
50	13.6	11.5	12.5	11.3	13.8	11.7	15.1	14.1
100	27.6	27.0	26.9	23.0	27.4	24.3	31.1	29.4
300	71.6	69.0	66.9	62.0	65.4	60.3	78.1	74.4
500	103.6	103.0	98.9	93.0	90.4	87.3	111.1	109.4
Accept all data								
Slope	0.2104	0.2094	0.2003	0.1880	0.1840	0.1772	0.2267	0.2217
MRC intercept	2.62	1.72	2.30	1.77	3.52	2.34	3.00	2.61
Cor. coef.	0.9958	0.9969	0.9962	0.9978	0.9915	0.9951	0.9942	0.9963
Linear eqn. Conc. (ppm)	$\frac{MRC-2.62}{0.2104}$	$\frac{MRC-1.72}{0.2094}$	$\frac{MRC-2.30}{0.2003}$	$\frac{MRC-1.77}{0.1880}$	$\frac{MRC-3.52}{0.1840}$	$\frac{MRC-2.34}{0.1772}$	$\frac{MRC-3.00}{0.2267}$	$\frac{MRC-2.61}{0.2217}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-2.19}{0.2098}$		$\frac{MRC-2.05}{0.1942}$		$\frac{MRC-2.95}{0.1807}$		$\frac{MRC-2.81}{0.2243}$	
Rel. response (% C_6H_6)	25.0	25.3	24.6	21.2	23.9	22.0	28.1	26.8
Ave. Rel. Resp. (% C_6H_6)	25.1		23.0		23.0		27.5	
Working Range								
Meter Reading Corrected (MRC)	5 - 150		5 - 150		5 - 100		5 - 150	
Carbon disulphide (appr. ppm)	10 - 500		10 - 500		10 - 500		10 - 500	

CARBON TETRACHLORIDE CCl_4 MW 153.8

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

CHLORINE Cl_2 MW 70.91

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

CHLOROFORM $CHCl_3$ MW 119.4

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

CRESOL C_7H_8O MW 108.1

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

CUMENE $C_6H_5CH(CH_3)_2$ MW 120.2 TRIAL 1 HNU 1,2,3 and 4

MYLAR BAGS Total volume: 44.0 liters

Meter Reading Corrected (MRC)

Std. (ppm)	HNU 1 1.	HNU 1 2.	HNU 2 1.	HNU 2 2.	HNU 3 1.	HNU 3 2.	HNU 4 1.	HNU 4 2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	4.7	10.0	6.7	7.7	3.5	4.2	6.7	6.4
20	29.5	31.4	27.6	27.4	19.5	20.6	30.5	31.4
30	37.5	37.4	32.6	31.4	25.5	23.6	35.5	37.4
40	14.7	15.4	13.0	13.2	9.5	9.0	14.5	14.1
50	17.5	18.6	16.6	17.2	12.0	12.0	18.5	18.6
100	35.5	36.4	31.6	33.4	23.5	23.6	35.5	36.4
500	141.5	139.4	139.6	147.4	99.5	97.6	144.5	144.4
1000	209.5	209.4	209.6	209.4	151.5	154.6	199.5	209.4

Reject 20, 30 and 1000 ppm data all tests

	HNU 1 1.	HNU 1 2.	HNU 2 1.	HNU 2 2.	HNU 3 1.	HNU 3 2.	HNU 4 1.	HNU 4 2.
Slope	0.2786	0.2703	0.2748	0.2902	0.1964	0.1922	0.2835	0.2835
MRC intercept	3.15	5.10	2.52	2.63	1.75	1.98	3.55	3.58
Cor. coef.	0.9988	0.9981	0.9996	0.9995	0.9994	0.9992	0.9991	0.9988
Linear eqn. Conc. (ppm)	$\frac{MRC-3.15}{0.2786}$	$\frac{MRC-5.10}{0.2703}$	$\frac{MRC-2.52}{0.2748}$	$\frac{MRC-2.63}{0.2902}$	$\frac{MRC-1.75}{0.1964}$	$\frac{MRC-1.98}{0.1922}$	$\frac{MRC-3.55}{0.2835}$	$\frac{MRC-3.58}{0.2835}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-4.16}{0.2746}$		$\frac{MRC-2.57}{0.2825}$		$\frac{MRC-1.89}{0.1943}$		$\frac{MRC-3.59}{0.2835}$	
Rel. response (% C_6H_6)	32.4	31.3	29.1	30.8	21.8	21.6	32.0	32.8
Ave. Rel. Resp. (% C_6H_6)	31.8		29.9		21.7		32.4	

Working Range

	HNU 1	HNU 2	HNU 3	HNU 4
Meter Reading Corrected (MRC)	7 - 150	5 - 150	5 - 100	5 - 150
Cumene (approx. ppm)	10 - 500	10 - 500	10 - 500	10 - 500

CYCLOHEXANE C_6H_{12} MW 84.2 TRIAL 1 HNU 2,3 and 4

MYLAR BAGS Total volume: 44.0 liters

	HNU 1		HNU 2		HNU 3		HNU 4	
			Meter Reading Corrected (MRC)					
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0			0.0	0.0	0.0	0.0	0.0	0.0
50			29.5	29.2	27.6	26.6	29.6	27.5
100			44.5	41.2	39.6	38.6	43.6	41.5
150			48.5	47.2	44.6	42.6	45.6	45.5
200			62.5	62.2	57.6	57.6	60.6	59.5
250			74.5	73.2	68.6	67.6	71.6	70.5
300			88.5	86.2	80.6	80.6	83.6	83.5
400			97.5	99.2	88.6	89.6	94.6	92.5
600			141.5	139.2	136.6	141.6	127.6	121.5
Accept all data								
Slope			0.2177	0.2171	0.2082	0.2170	0.1973	0.1902
MRC intercept			15.64	14.74	13.00	11.10	16.93	16.89
Cor. coef.			0.9838	0.9864	0.9868	0.9895	0.9776	0.9736
Linear eqn. Conc. (ppm)			$\frac{MRC-15.64}{0.2177}$	$\frac{MRC-14.74}{0.2171}$	$\frac{MRC-13.00}{0.2082}$	$\frac{MRC-11.10}{0.2170}$	$\frac{MRC-16.93}{0.1973}$	$\frac{MRC-16.89}{0.1902}$
Ave. lin. eqn. Co. (ppm)			$\frac{MRC-15.22}{0.2174}$		$\frac{MRC-12.05}{0.2126}$		$\frac{MRC-16.94}{0.1938}$	
Rel. response (% C_6H_6)			37.4	36.4	33.8	32.8	36.7	35.9
Ave. Rel. Resp. (% C_6H_6)			37.1		33.3		36.3	
Working Range								
Meter Reading Corrected (MRC)			20 - 150		20 - 150		20 - 150	
Cyclohexane (approx. ppm)			20 - 600		20 - 600		20 - 600	

o-DICHLOROBENZENE $C_6H_4Cl_2$ MW 147.0 TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

Meter Reading Corrected (MRC)

	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	4.4	3.65	3.7	4.6	4.15	3.9	3.7	4.4
30	8.6	7.7	7.1	8.9	7.75	7.85	7.3	8.5
45	14.1	13.75	16.2	14.8	14.8	12.55	14.1	14.0
60	21.6	15.85	21.7	18.4	18.3	16.85	19.3	16.9
75	27.6	20.25	27.2	22.9	22.3	19.85	23.3	20.9
150	62.1	48.75	65.7	54.9	53.3	47.35	53.8	48.9
500	139.6	124.75	169.7	158.9	134.3	126.85	141.8	141.4
1000	209.6	195.75	259.7	238.9	199.3	199.35	229.3	209.4

Reject 1000 ppm data all tests

Slope	0.2141	0.2003	0.2681	0.2478	0.2053	0.2043	0.2341	0.2172
MRC intercept	9.57	6.09	7.58	6.41	7.70	5.72	5.91	6.35
Cor. coef.	0.9835	0.9903	0.9880	0.9884	0.9853	0.9911	0.9927	0.9872
Linear eqn. Conc. (ppm)	$\frac{MRC-9.57}{0.2141}$	$\frac{MRC-6.09}{0.2003}$	$\frac{MRC-7.58}{0.2681}$	$\frac{MRC-6.41}{0.2478}$	$\frac{MRC-7.70}{0.2053}$	$\frac{MRC-5.72}{0.2043}$	$\frac{MRC-5.91}{0.2341}$	$\frac{MRC-6.35}{0.2172}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-7.83}{0.2072}$		$\frac{MRC-7.00}{0.2580}$		$\frac{MRC-6.71}{0.2048}$		$\frac{MRC-6.13}{0.2257}$	
Rel. response (% C_6H_6)	31.0	26.1	34.4	31.2	28.2	26.1	29.3	28.1
Ave. Rel. Resp. (% C_6H_6)	28.6		32.8		27.2		28.7	

Working Range

Meter Reading Corrected (MRC)	20 - 250	20 - 250	15 - 250	15 - 250
o-Dichlorobenzene (appr. ppm)	50 - 1000	50 - 1000	50 - 1000	50 - 1000

DIMETHYLAMINE $(CH_3)_2NH$ MW 45.1

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 20 ppm

ETHANOL C_2H_5OH MW 46.1 TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100	2.8	2.6	2.3	2.0	2.5	2.4	3.0	3.2
190	4.4	4.0	3.6	2.9	4.1	3.6	4.5	4.0
380	9.7	8.8	8.4	6.7	9.5	8.9	10.4	10.9
760	16.2	14.6	13.6	12.6	15.6	14.6	18.6	18.5
950	19.1	18.4	15.8	15.3	18.3	17.9	21.4	21.3
1850	31.8	27.6	19.2	23.1	28.5	27.4	32.4	33.3
Accept all data								
Slope	0.0171	0.0150	0.0106	0.0127	0.0155	0.0149	0.0177	0.0181
MRC intercept	1.68	1.79	2.56	1.25	1.88	1.66	2.19	2.07
Cor. coef.	0.9921	0.9853	0.9363	0.9854	0.9848	0.9854	0.9817	0.9841
Linear eqn. Conc. (ppm)	$\frac{MRC-1.68}{0.0171}$	$\frac{MRC-1.79}{0.0150}$	$\frac{MRC-2.56}{0.0106}$	$\frac{MRC-1.25}{0.0127}$	$\frac{MRC-1.88}{0.0155}$	$\frac{MRC-1.66}{0.0149}$	$\frac{MRC-2.19}{0.0177}$	$\frac{MRC-2.07}{0.0181}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-1.74}{0.0161}$		$\frac{MRC-1.90}{0.0117}$		$\frac{MRC-1.77}{0.0152}$		$\frac{MRC-2.13}{0.0179}$	
Rel. response (% C_6H_6)	3.4	3.3	3.1	2.5	3.4	3.2	4.0	3.9
Ave. Rel. Resp. (% C_6H_6)	3.35		3.1		3.3		4.0	

Working Range

	HNU 1	HNU 2	HNU 3	HNU 4
Meter Reading Corrected (MRC)	3 - 50	3 - 50	3 - 50	3 - 50
Ethanol (approx. ppm)	50 - 1850	100 - 1850	100 - 1850	50 - 1850

ETHANOLAMINE $H_2NCH_2CH_2OH$ MW 61.1

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 100 ppm

ETHYL BENZENE $C_6H_5C_2H_5$ MW 106.2 TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	6.8	6.4	4.1	5.1	3.9	5.0	6.3	6.0
40	14.4	14.2	12.0	8.0	9.5	8.7	13.9	12.3
60	23.0	17.2	21.8	20.8	19.5	15.0	23.6	21.0
80	27.0	27.2	29.8	30.8	28.5	24.0	31.6	30.0
100	34.0	35.2	35.8	40.8	33.5	31.0	39.6	38.0
200	75.0	71.2	77.8	81.8	70.5	63.0	77.6	75.0
500	159.0	153.2	175.8	182.8	155.5	140.0	161.6	157.0
1000	247.0	243.2	273.8	292.8	233.5	213.0	235.6	225.0
2000	317.0	313.2	383.8	402.8	293.5	293.0	295.6	295.0
Reject 2000 ppm data all tests								
Slope	0.2523	6.2482	0.2823	0.3014	0.2414	0.2201	0.2414	0.2319
MRC intercept	9.07	7.94	7.37	6.68	7.96	6.62	11.89	11.17
Cor. coef.	0.9895	0.9916	0.9902	0.9915	0.9865	0.9878	0.9820	0.9808
Linear eqn. Conc. (ppm)	$\frac{MRC-9.07}{0.2523}$	$\frac{MRC-7.94}{0.2482}$	$\frac{MRC-7.37}{0.2823}$	$\frac{MRC-6.68}{0.3014}$	$\frac{MRC-7.96}{0.2414}$	$\frac{MRC-6.62}{0.2201}$	$\frac{MRC-11.89}{0.2414}$	$\frac{MRC-11.17}{0.2319}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-8.51}{0.2503}$		$\frac{MRC-7.03}{0.2919}$		$\frac{MRC-7.29}{0.2308}$		$\frac{MRC-11.53}{0.2367}$	
Rel. response (% C_6H_6)	34.3	32.8	35.6	36.8	32.1	28.6	36.0	34.4
Ave. Rel. Resp. (% C_6H_6)	33.6		36.2		30.4		35.2	
Working Range								
Meter Reading Corrected (MRC)	15 - 300		15 - 300		15 - 300		25 - 300	
Ethyl benzene (approx. ppm)	25 - 1000		25 - 1000		25 - 1000		50 - 1000	

2-ETHYL HEXANOL $CH_3(CH_2)_3CH(C_2H_5)CH_2OH$ MW 130.2

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

ETHYLENE $CH_2=CH_2$ MW 28.05

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 300 ppm

ETHYLENE DIBROMIDE $BrCH_2CH_2Br$ MW 187.9 TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	1.6	1.0	1.5	1.6	2.0	2.0	1.9	1.9
20	3.2	2.7	2.8	2.8	3.1	3.0	4.0	3.9
50	7.6	6.3	6.5	6.2	7.5	7.2	9.3	9.2
100	14.6	13.7	13.4	12.9	15.1	14.5	18.5	17.8
200	29.6	27.0	24.2	25.2	27.2	27.2	33.4	33.3
400	48.6	51.0	44.2	43.2	47.2	46.2	57.4	57.3
Accept all data								
Slope	0.1234	0.1286	0.1105	0.1091	0.1182	0.1162	0.1442	0.1441
MRC intercept	1.28	0.20	0.91	0.98	1.41	1.35	1.72	1.57
Cor. coef.	0.9945	0.9994	0.9982	0.9966	0.9963	0.9958	0.9957	0.9963
Linear eqn. Conc. (ppm)	$\frac{MRC-1.28}{0.1234}$	$\frac{MRC-0.20}{0.1286}$	$\frac{MRC-0.91}{0.1105}$	$\frac{MRC-0.98}{0.1091}$	$\frac{MRC-1.41}{0.1182}$	$\frac{MRC-1.35}{0.1162}$	$\frac{MRC-1.72}{0.1442}$	$\frac{MRC-1.57}{0.1441}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-0.74}{0.1260}$		$\frac{MRC-0.95}{0.1098}$		$\frac{MRC-1.38}{0.1172}$		$\frac{MRC-1.65}{0.1442}$	
Rel. response (% C_6H_6)	13.6	13.1	12.0	11.9	13.2	13.0	16.1	16.0
Ave. Rel. Resp. (% C_6H_6)	13.4		12.0		13.1		16.1	
Working Range								
Meter Reading Corrected (MRC)	1.3 - 50		1.3 - 50		1.3 - 50		2.0 - 75	
Ethylene dibromide (Appr. ppm)	5 - 400		5 - 400		5 - 400		5 - 400	

ETHYLENE DICHLORIDE $ClCH_2CH_2Cl$ MW 98.96

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 400 ppm

ETHYLENE OXIDE $\overline{CH_2CH_2O}$ MW 44.1 TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
8	0.0		0.0		0.0		0.0	
10	0.2		0.3		0.35		0.5	
20	0.4		0.55		0.55		0.9	
100	1.4		1.6		1.85		2.35	
400	7.2		6.95		7.35		9.5	
800	14.2		14.0		15.95		19.4	
Accept all data as shown								
Slope	0.0179		0.0174		0.0199		0.0240	
MRC intercept	-0.09		0.01		0.00		0.09	
Cor. coef.	0.9996		0.9998		0.9998		0.9995	
Linear eqn. Conc. (ppm)	$\frac{MRC+0.09}{0.0179}$		$\frac{MRC-0.01}{0.0174}$		$\frac{MRC+0.00}{0.0199}$		$\frac{MRC-0.09}{0.0240}$	
Rel. response (% C_6H_6)	1.7		1.8		2.0		2.5	
Working Range								
Meter Reading Corrected (MRC)	0 - 25		0 - 25		0 - 25		0 - 25	
Ethylene oxide (appr. ppm)	8 - 800		8 - 800		8 - 800		8 - 800	

FORMALDEHYDE HCOH Mw 30.0

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 1000 ppm

FORMIC ACID HCOOH MW 46.0

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 1000 ppm

n-HEXANE $CH_3(CH_2)_4CH_3$ MW 86.2 TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.9	0.9	0.4	0.5	0.6	0.6	1.2	1.0
20	2.1	2.0	1.4	1.2	1.8	1.8	2.6	2.4
40	4.1	4.1	2.8	2.6	3.8	3.7	5.4	5.3
50	7.1	6.9	5.4	4.8	6.7	6.6	9.7	9.2
100	10.6	10.3	7.4	6.8	10.0	10.0	14.3	14.1
500	43.9	43.9	30.4	28.4	39.2	40.2	55.3	55.2
Accept all data								
Slope	0.0867	0.0868	0.0600	0.0561	0.0774	0.0795	0.1088	0.1090
MRC intercept	0.90	0.80	0.65	0.55	0.91	0.81	1.45	1.24
Cor. coef.	0.9977	0.9981	0.9963	0.9971	0.9964	0.9971	0.9962	0.9967
Linear eqn. Conc. (ppm)	$\frac{\text{MRC}-0.90}{0.0867}$	$\frac{\text{MRC}-0.80}{0.0868}$	$\frac{\text{MRC}-0.65}{0.0600}$	$\frac{\text{MRC}-0.55}{0.0561}$	$\frac{\text{MRC}-0.91}{0.0774}$	$\frac{\text{MRC}-0.81}{0.0795}$	$\frac{\text{MRC}-1.45}{0.1088}$	$\frac{\text{MRC}-1.24}{0.1090}$
Ave. lin. eqn. Co. (ppm)	$\frac{\text{MRC}-0.85}{0.0868}$		$\frac{\text{MRC}-0.60}{0.0580}$		$\frac{\text{MRC}-0.86}{0.0785}$		$\frac{\text{MRC}-1.34}{0.1089}$	
Rel. response (% C_6H_6)	9.6	9.5	6.6	6.2	8.6	8.8	12.3	12.1
Ave. Rel. Resp. (% C_6H_6)	9.6		6.4		8.7		12.2	
Working Range								
Meter Reading Corrected (MRC)	1.5 - 50		1 - 50		1.5 - 50		2.5 - 75	
n-Hexane (approx. ppm)	5 - 500		5 - 500		5 - 500		10 - 500	

HYDRAZINE H_2NNH_2 MW 32.05

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 300 ppm

HYDROGEN H_2 MW 2.016

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 100 ppm

HYDROGEN CHLORIDE HCl MW 36.46

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 500 ppm

HYDROGEN FLUORIDE	HF	20.01

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

HYDROGEN PEROXIDE H_2O_2 MW 34.0 (pure)

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 300 ppm

HYDROGEN SULPHIDE H_2S MW 34.08

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: pure gas

ISOPROPANOL $CH_3CH(OH)CH_3$ MW 60.1 TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	3.8	3.0	3.2	3.2	3.5	3.5	3.2	3.1
100	5.9	5.2	5.4	5.3	6.3	5.9	5.2	5.1
150	9.0	8.4	11.8	12.0	13.4	14.2	12.7	12.2
200	13.7	13.0	11.4	10.4	12.0	11.4	11.2	10.0
300	15.2	15.8	14.6	13.2	15.9	15.9	14.5	13.2
400	21.0	17.2	16.6	16.4	19.3	18.8	19.2	17.0
500	35.0	31.4	31.6	28.6	33.3	32.2	32.2	30.2

Accept all data as shown despite discrepancies

	HNU 1		HNU 2		HNU 3		HNU 4	
	1.	2.	1.	2.	1.	2.	1.	2.
Slope	0.0623	0.0550	0.0536	0.0489	0.0576	0.0557	0.0565	0.0517
MRC intercept	-0.29	0.18	0.42	0.74	0.71	0.90	0.26	0.35
Cor. coef.	0.9745	0.9683	0.9531	0.9563	0.9630	0.9576	0.9647	0.9537
Linear eqn. Conc. (ppm)	$\frac{MRC+0.29}{0.0623}$	$\frac{MRC-0.18}{0.0550}$	$\frac{MRC-0.42}{0.0536}$	$\frac{MRC-0.74}{0.0489}$	$\frac{MRC-0.71}{0.0576}$	$\frac{MRC-0.90}{0.0557}$	$\frac{MRC-0.26}{0.0565}$	$\frac{MRC-0.35}{0.0517}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC+0.06}{0.0587}$		$\frac{MRC-0.58}{0.0512}$		$\frac{MRC-0.81}{0.0567}$		$\frac{MRC-0.31}{0.0541}$	
Rel. response (% C_6H_6)	6.5	6.0	6.2	6.1	7.0	7.0	6.4	6.0
Ave. Rel. Resp. (% C_6H_6)	6.3		6.2		7.0		6.2	

Working Range

	HNU 1	HNU 2	HNU 3	HNU 4
Meter Reading Corrected (MRC)	1 - 50	1 - 50	1.5 - 50	1 - 50
Isopropanol (approx. ppm)	20 - 500	10 - 500	10 - 500	10 - 500

MERCURY Hg MW 200.59

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

METHANOL CH_3OH MW 32.0

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 500 ppm

MONOMETHYLAMINE CH_3NH_2 MW 31.1

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 20 ppm

METHYL ETHYL KETONE $CH_3CH_2COCH_3$ MW 72.1 TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	31.9	27.2	31.7	27.2	27.6	22.7	24.4	19.8
100	49.9	43.2	51.7	46.2	45.6	38.7	39.4	32.8
150	64.9	57.2	69.7	61.2	61.6	50.7	53.4	44.8
200	76.9	67.2	81.7	72.2	69.6	60.7	60.4	52.8
400	127.9	116.2	147.7	128.2	117.6	104.7	108.4	93.8
3000	239.9	259.2	369.7	318.2	259.6	238.7	249.4	228.8

Reject 3000 ppm data all tests

	HNU 1		HNU 2		HNU 3		HNU 4	
	1.	2.	1.	2.	1.	2.	1.	2.
Slope	0.3014	0.2753	0.3526	0.3063	0.2784	0.2501	0.2571	0.2247
MRC intercept	13.38	10.54	10.87	9.89	11.91	8.74	9.10	6.96
Cor. coef.	0.9829	0.9872	0.9916	0.9904	0.9825	0.9887	0.9884	0.9912
Linear eqn. Conc. (ppm)	$\frac{MRC-13.38}{0.3014}$	$\frac{MRC-10.54}{0.2753}$	$\frac{MRC-10.87}{0.3526}$	$\frac{MRC-9.89}{0.3063}$	$\frac{MRC-11.91}{0.2784}$	$\frac{MRC-8.74}{0.2501}$	$\frac{MRC-9.10}{0.2571}$	$\frac{MRC-6.96}{0.2247}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-11.96}{0.2883}$		$\frac{MRC-10.38}{0.3295}$		$\frac{MRC-10.32}{0.2642}$		$\frac{MRC-8.03}{0.2409}$	
Rel. response (% C_6H_6)	43.5	38.1	46.1	40.5	39.7	33.7	34.8	29.4
Ave. Rel. Resp. (% C_6H_6)	40.8		43.3		36.7		32.1	
Working Range								
Meter Reading Corrected (MRC)	20 - 150		20 - 150		20 - 150		10 - 150	
Methyl ethyl ketone (app. ppm)	25 - 400		30 - 400		30 - 400		10 - 400	

METHYL ISOBUTYL KETONE $CH_3(CH_2)_3COCH_3$ MW 100.2 TRIAL 1 HNU 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0			0.0	0.0	0.0	0.0	0.0	0.0
20			18.1	17.0	16.4	15.4	16.7	16.0
40			12.1	11.0	9.8	9.4	9.8	9.0
60			30.1	34.0	25.4	27.4	25.7	27.0
80			32.1	31.0	27.4	27.4	27.7	26.0
100			100.1	101.0	81.4	79.4	77.7	77.0
200			86.1	81.0	72.4	65.4	65.7	64.0
500			190.1	179.0	141.4	141.4	137.7	136.0
1000			270.1	241.0	191.4	191.4	179.7	180.0

Accept all data as shown despite discrepancies

	HNU 2 1.	HNU 2 2.	HNU 3 1.	HNU 3 2.	HNU 4 1.	HNU 4 2.
Slope	0.2692	0.2395	0.1885	0.1889	0.1773	0.1776
MRC intercept	22.11	23.87	20.85	19.82	20.57	19.88
Cor. coef.	0.9586	0.9438	0.9414	0.9458	0.9383	0.9406
Linear eqn. Conc. (ppm)	$\frac{MRC-22.11}{0.2692}$	$\frac{MRC-23.87}{0.2395}$	$\frac{MRC-20.85}{0.1885}$	$\frac{MRC-19.82}{0.1889}$	$\frac{MRC-20.57}{0.1773}$	$\frac{MRC-19.88}{0.1776}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-22.99}{0.2544}$		$\frac{MRC-20.34}{0.1887}$		$\frac{MRC-20.22}{0.1775}$	
Rel. response (% C_6H_6)	49.0	47.8	39.7	38.7	38.3	37.6
Ave. Rel. Resp. (% C_6H_6)	48.4		39.2		38.0	

Working Range

	HNU 2	HNU 3	HNU 4
Meter Reading Corrected (MRC)	50 - 300	50 - 200	40 - 200
Methyl isobutyl ketone (app. ppm)	100 - 1000	100 - 1000	100 - 1000

METHYL METHACRYLATE $CH_2=C(CH_3)COOCH_3$ MW 100.1 TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	5.1	5.0	4.5	2.2	4.7	3.6	4.5	2.2
40	10.2	5.8	10.2	6.9	10.3	8.5	8.8	6.5
60	13.4	10.2	14.8	10.3	16.1	12.9	14.5	11.5
80	21.9	16.0	21.4	16.0	20.9	17.3	19.1	13.3
100	23.9	17.8	23.4	17.6	24.9	21.3	23.1	18.5
200	39.2	40.9	42.4	32.6	42.9	39.3	37.1	33.0
2000	155.7	148.4	195.4	189.6	174.9	176.3	175.1	168.5

Reject 2000 ppm data all tests

Slope	0.1969	0.2035	0.2156	0.1668	0.2152	0.1982	0.1872	0.1688
MRC intercept	2.18	-0.86	2.70	0.32	1.74	0.54	1.93	0.09
Cor. coef.	0.9840	0.9946	0.9406	0.9938	0.9931	0.9982	0.9876	0.9957
Linear eqn. Conc. (ppm)	$\frac{MRC-2.18}{0.1969}$	$\frac{MRC+0.86}{0.2035}$	$\frac{MRC-2.70}{0.2156}$	$\frac{MRC-0.32}{0.1668}$	$\frac{MRC-1.74}{0.2152}$	$\frac{MRC-0.54}{0.1982}$	$\frac{MRC-1.93}{0.1872}$	$\frac{MRC-0.09}{0.1688}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-0.66}{0.2002}$		$\frac{MRC-1.51}{0.1912}$		$\frac{MRC-1.14}{0.2067}$		$\frac{MRC-1.01}{0.1780}$	
Rel. response (% C_6H_6)	19.0	19.5	24.3	17.0	23.3	20.4	20.6	17.0
Ave. Rel. Resp. (% C_6H_6)	19.3		20.7		21.9		18.8	
Working Range								
Meter Reading Corrected (MRC)	2 - 50		3 - 50		3 - 50		3 - 50	
Mehtyl methacrylate (app. ppm)	5 - 200		5 - 200		10 - 200		10 - 200	

METHYLENE CHLORIDE CH_2Cl_2 MW 84.9

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 1000 ppm

MORPHOLINE C_4H_8ONH MW 87.1

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)			
	HNU 1	HNU 2	HNU 3	HNU 4
Std. (ppm)				
0	0.0	0.0	0.0	0.0
5	2.0	3.1	2.7	4.3
10	3.0	4.3	3.2	4.8
15	6.2	7.2	6.7	8.4
20	5.6	6.4	5.5	7.7
30	2.4	3.6	2.1	4.4

Reject 30 ppm data all tests. 40, 50 and 100 ppm tests also rejected

	HNU 1	HNU 2	HNU 3	HNU 4
Slope	0.3080	0.3380	0.3000	0.3900
MRC intercept	0.28	0.82	0.62	1.14
Cor. coef.	0.9487	0.9346	0.9104	0.9257
Linear eqn. Conc. (ppm)	$\frac{MRC-0.28}{0.3080}$	$\frac{MRC-0.82}{0.3380}$	$\frac{MRC-0.62}{0.3000}$	$\frac{MRC-1.14}{0.3900}$
Rel. response (% C_6H_6)	31.1	34.6	30.6	40.1

Working Range

	HNU 1	HNU 2	HNU 3	HNU 4
Meter Reading Corrected	1 - 10	1 - 10	2 - 10	2 - 10
Morpholine (app. ppm)	2 - 20	2 - 20	3 - 20	3 - 20

NAPHTHA Composition variable MW approx. 125 TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

Meter Reading Corrected (MRC)

	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	4.2	3.9	3.0	3.2	3.2	4.0	4.9	5.2
50	11.6	11.2	8.9	9.2	10.4	10.6	13.9	15.1
75	15.8	15.3	12.1	12.3	14.4	14.5	19.8	19.1
100	20.8	19.4	15.9	16.0	19.2	19.0	25.8	26.1
200	35.8	37.6	29.6	29.2	34.2	35.0	48.8	49.1
1000	119.8	119.6	93.6	92.2	104.2	103.0	144.8	144.1

Reject 1000 ppm data all tests

	HNU 1		HNU 2		HNU 3		HNU 4	
Slope	0.1798	0.1884	0.1490	0.1464	0.1734	0.1754	0.2461	0.2461
MRC intercept	1.22	0.44	0.41	0.67	0.56	0.70	0.41	0.64
Cor. coef.	0.9930	0.9975	0.9968	0.9957	0.9947	0.9971	0.9979	0.9971
Linear eqn. Conc. (ppm)	$\frac{MRC-1.22}{0.1798}$	$\frac{MRC-0.44}{0.1884}$	$\frac{MRC-0.41}{0.1490}$	$\frac{MRC-0.67}{0.1464}$	$\frac{MRC-0.56}{0.1734}$	$\frac{MRC-0.70}{0.1754}$	$\frac{MRC-0.41}{0.2461}$	$\frac{MRC-0.64}{0.2461}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-0.83}{0.1841}$		$\frac{MRC-0.54}{0.1477}$		$\frac{MRC-0.63}{0.1744}$		$\frac{MRC-0.52}{0.2461}$	
Rel. response (% C_6H_6)	19.1	19.3	15.3	15.3	17.9	18.2	25.0	25.2
Ave. Rel. Resp. (% C_6H_6)	19.2		15.3		18.1		25.1	

Working Range

	HNU 1	HNU 2	HNU 3	HNU 4
Meter Reading Corrected (MRC)	2 - 50	2 - 50	2 - 50	2 - 50
Naphtha (approx. ppm)	5 - 200	10 - 200	10 - 200	5 - 200

PERCHLOROETHYLENE $Cl_2C{=}CCl_2$ MW 165.8

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

	Meter Reading Corrected (MRC)			
Std. (ppm)	HNU 1	HNU 2	HNU 3	HNU 4
0	0.0	0.0	0.0	0.0
20	6.85	6.9	7.75	6.1
40	12.0	14.9	16.05	12.9
60	23.3	22.3	23.1	19.0
80	29.3	27.8	28.1	23.8
100	37.3	36.3	37.8	30.3
200	49.8	63.3	65.6	49.3
500	123.8	135.3	126.1	107.8

Accept all data

	HNU 1	HNU 2	HNU 3	HNU 4
Slope	0.2388	0.2681	0.2477	0.2103
MRC intercept	5.44	3.59	7.10	4.87
Cor. coef.	0.9925	0.9966	0.9909	0.9958
Linear eqn. Conc. (ppm)	$\frac{MRC-5.44}{0.2388}$	$\frac{MRC-3.59}{0.2681}$	$\frac{MRC-7.10}{0.2477}$	$\frac{MRC-4.87}{0.2103}$
Rel. response (% C_6H_6)	29.3	30.4	31.9	25.9

Working Range

	HNU 1	HNU 2	HNU 3	HNU 4
Meter Reading Corrected	5 - 150	5 - 150	10 - 150	10 - 150
Perchloroethylene (ap. ppm)	10 - 500	10 - 500	10 - 500	10 - 500

PHOSPHORIC ACID H_3PO_4 MW 98.0

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

PROPYLENE $CH_3CH{=}CH_2$ MW 42.1 TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	4.1	3.8	4.1	4.0	3.6	3.3	3.6	3.1
100	7.5	7.3	7.8	7.5	6.8	6.3	6.7	6.0
150	12.7	11.9	13.3	12.1	11.0	10.2	10.9	9.7
200	14.8	14.2	15.3	14.4	12.7	11.8	12.3	11.1
250	14.6	13.9	14.7	13.8	12.0	11.2	11.5	10.4
300	18.2	17.3	18.4	17.2	15.0	14.2	14.5	13.1

Accept all data as shown despite discrepancies

Slope	0.0592	0.0564	0.0599	0.0558	0.0484	0.0456	0.0464	0.0421
MRC intercept	1.39	1.31	1.53	1.49	1.48	1.30	1.55	1.31
Cor. coef.	0.9730	0.9737	0.9660	0.9687	0.9612	0.9644	0.9557	0.9585
Linear eqn. Conc. (ppm)	$\frac{MRC-1.39}{0.0592}$	$\frac{MRC-1.31}{0.0564}$	$\frac{MRC-1.53}{0.0599}$	$\frac{MRC-1.49}{0.0558}$	$\frac{MRC-1.48}{0.0484}$	$\frac{MRC-1.30}{0.0456}$	$\frac{MRC-1.55}{0.0464}$	$\frac{MRC-1.31}{0.0421}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-1.35}{0.0578}$		$\frac{MRC-1.50}{0.0579}$		$\frac{MRC-1.39}{0.0470}$		$\frac{MRC-1.42}{0.0443}$	
Rel. response (% C_6H_6)	7.3	7.0	7.5	7.1	6.3	5.9	6.2	5.5
Ave. Rel. Resp. (% C_6H_6)	7.2		7.3		6.1		5.9	

Working Range

Meter Reading Corrected (MRC)	2 - 25	2 - 25	2 - 25	2 - 25
Propylene (approx. ppm)	10 - 300	10 - 300	10 - 300	10 - 300

PROPYLENE GLYCOL $CH_3CH(OH)CH_2OH$ MW 76.1

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 1000 ppm

PROPYLENE OXIDE CH_3CHOCH_2 MW 58.1

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 50 ppm

STYRENE MONOMER $C_6H_5CH=CH_2$ MW 104.2

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 5000 ppm

The monomer polymerizes in the presence of UV light from HNU source

SULPHURYL CHLORIDE SO_2Cl_2 MW 134.97

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

TETRAETHYL LEAD $(CH_3CH_2)_4Pb$ MW 323.4 (pure) TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters MLA250 - DILUTE

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	3.4	2.8	4.8	4.0	4.1	3.5	3.5	2.8
5	13.2	11.6	16.8	14.2	16.3	13.7	14.6	11.4
10	23.6	20.6	28.6	23.6	27.6	23.6	23.5	19.2
15	35.6	31.6	42.6	35.6	42.6	35.6	35.5	28.5
20	44.6	37.6	51.6	43.6	51.6	43.6	42.5	34.5
25	53.6	43.6	62.6	51.6	63.6	53.6	53.5	42.5
Accept all data								
Slope	2.1462	1.7756	2.4750	2.0569	2.5201	2.1225	1.8842	1.6769
MRC intercept	1.56	1.84	2.70	2.33	2.04	1.76	2.02	1.64
Cor. coef.	0.9981	0.9936	0.9965	0.9959	0.9975	0.9977	0.9966	0.9968
Linear eqn. Conc. (ppm)	$\frac{MRC-1.56}{2.1462}$	$\frac{MRC-1.84}{1.7756}$	$\frac{MRC-2.70}{2.4750}$	$\frac{MRC-2.33}{2.0569}$	$\frac{MRC-2.04}{2.5201}$	$\frac{MRC-1.76}{2.1225}$	$\frac{MRC-2.02}{1.8842}$	$\frac{MRC-1.64}{1.6769}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-1.70}{1.9609}$		$\frac{MRC-2.52}{2.2660}$		$\frac{MRC-1.90}{2.3213}$		$\frac{MRC-1.83}{1.8842}$	
Rel. response (% C_6H_6)	216.2	179.4	250.2	208.0	254.0	214.0	211.2	169.3
Ave. Rel. Resp. (% C_6H_6)	197.8		229.1		234.0		190.3	
Working Range								
Meter Reading Corrected (MRC)	2 - 75		3 - 75		3 - 75		3 - 75	
Tetraethyl lead (approx. ppm)	0.2 - 25		0.2 - 25		0.5 - 25		0.5 - 25	

TETRAETHYL LEAD $(CH_3CH_2)_4Pb$ MW 323.4 (pure) TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters MLA500

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	2.2	2.7	3.35	3.4	3.1	3.0	3.4	2.9
5	15.3	14.1	17.95	15.4	19.1	17.6	17.1	14.9
10	27.0	24.8	30.35	26.6	31.1	27.4	29.5	24.5
15	41.0	37.8	44.35	39.6	49.1	41.4	44.5	37.5
20	49.0	43.8	52.35	43.6	57.1	48.4	51.5	43.5
25	69.0	59.8	73.35	61.6	81.1	69.4	71.5	59.5
Accept all data								
Slope	2.6491	2.3098	2.7876	2.3370	3.0896	2.6130	2.7366	2.2832
MRC intercept	0.31	1.07	1.41	1.80	0.81	1.23	1.36	1.33
Cor. coef.	0.9962	0.9964	0.9953	0.9929	0.9950	0.9937	0.9957	0.9958
Linear eqn. Conc. (ppm)	$\frac{MRC-0.31}{2.6491}$	$\frac{MRC-1.07}{2.3098}$	$\frac{MRC-1.41}{2.7876}$	$\frac{MRC-1.80}{2.3370}$	$\frac{MRC-0.81}{3.0896}$	$\frac{MRC-1.23}{2.6130}$	$\frac{MRC-1.36}{2.7366}$	$\frac{MRC-1.33}{2.2832}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-0.69}{2.4795}$		$\frac{MRC-1.61}{2.5623}$		$\frac{MRC-1.02}{2.8513}$		$\frac{MRC-1.35}{2.5099}$	
Rel. response (% C_6H_6)	265.2	232.0	280.2	235.5	309.8	262.5	275.0	229.6
Ave. Rel. Resp. (% C_6H_6)	248.6		257.9		286.2		252.3	
Working Range								
Meter Reading Corrected (MRC)	2 - 75		2 - 75		2 - 100		2 - 75	
Tetraethyl lead (appr. ppm)	0.5 - 25		0.2 - 25		0.4 - 25		0.2 - 25	

TETRAETHYL LEAD $(CH_3CH_2)_4Pb$ MW 323.4 (pure) TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters MLA750

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	2.3	3.5	4.05	4.40	4.4	4.3	4.7	4.5
5	23.0	18.5	21.35	21.6	25.1	22.5	22.5	19.9
10	43.0	34.7	40.35	37.6	46.1	40.5	42.5	36.9
15	61.0	51.7	59.35	54.6	67.1	58.5	61.5	51.9
20	76.0	65.7	79.35	66.6	83.1	73.5	76.5	63.9
25	91.0	81.7	96.35	81.6	102.1	88.5	92.5	79.9
Accept all data								
Slope	3.7057	3.2635	3.8748	3.6424	4.0879	3.5528	3.7176	3.1528
MRC intercept	3.09	1.11	0.90	1.11	2.46	2.54	2.52	2.48
Cor. coef.	0.9960	0.9993	0.9996	0.9896	0.9977	0.9974	0.9975	0.9975
Linear eqn. Conc. (ppm)	$\frac{MRC-3.09}{3.7057}$	$\frac{MRC-1.11}{3.2635}$	$\frac{MRC-0.90}{3.8748}$	$\frac{MRC-1.11}{3.6424}$	$\frac{MRC-2.46}{4.0879}$	$\frac{MRC-2.54}{3.5528}$	$\frac{MRC-2.52}{3.7176}$	$\frac{MRC-2.48}{3.1528}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-2.10}{3.4846}$		$\frac{MRC-1.00}{3.7586}$		$\frac{MRC-2.48}{3.8204}$		$\frac{MRC-2.50}{3.4352}$	
Rel. response (% C_6H_6)	373.7	327.5	388.4	365.4	411.2	357.8	374.3	317.8
Ave. Rel. Resp. (% C_6H_6)	350.6		376.9		384.5		346.5	
Working Range								
Meter Reading Corrected (MRC)	3 - 100		2 - 100		3.5 - 125		3.5 - 100	
Tetraethyl lead (approx. ppm)	0.25 - 25		0.25 - 25		0.25 - 25		0.25 - 25	

TETRAETHYL LEAD $(CH_3CH_2)_4Pb$ MW 323.4 (pure) TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

DILUTE VOLUME BASIS

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	2.6	2.6	3.5	3.6	3.8	3.4	4.0	3.0
5	12.9	10.6	15.9	12.9	15.2	12.9	14.4	11.2
10	23.0	18.8	27.8	22.6	27.2	22.6	24.4	19.4
15	33.0	26.6	38.8	31.6	38.2	31.6	33.4	25.6
20	40.0	32.6	46.8	38.6	45.2	47.6	39.4	31.6
25	51.0	41.6	55.8	47.6	57.2	57.6	49.4	40.6
Accept all data								
Slope	2.0020	1.6207	2.2262	1.8637	2.2341	2.2734	1.9108	1.5564
MRC intercept	1.48	1.38	2.77	2.18	2.43	0.42	2.83	1.87
Cor, coef.	0.9973	0.9975	0.9935	0.9963	0.9955	0.9925	0.9935	0.9955
Linear eqn. Conc. (ppm)	$\frac{MRC-1.48}{2.0020}$	$\frac{MRC-1.38}{1.6207}$	$\frac{MRC-2.77}{2.2262}$	$\frac{MRC-2.18}{1.8637}$	$\frac{MRC-2.43}{2.2231}$	$\frac{MRC-0.42}{2.2734}$	$\frac{MRC-2.83}{1.9108}$	$\frac{MRC-1.87}{1.5564}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-1.43}{1.8113}$		$\frac{MRC-2.47}{2.0450}$		$\frac{MRC-1.43}{2.2538}$		$\frac{MRC-2.35}{1.7336}$	
Rel. response (% C_6H_6)	201.7	163.4	225.4	188.5	225.8	227.8	193.9	157.5
Ave. Rel. Resp. (% C_6H_6)	182.6		207.0		226.8		175.7	
Working Range								
Meter Reading Corrected (MRC)	2 - 75		3 - 75		2 - 75		3 - 75	
Tetraethyl lead (approx. ppm)	0.25 - 25		0.25 - 25		0.25 - 25		0.35 - 25	

TETRAETHYL LEAD $(CH_3CH_2)_4Pb$ 323.4 (pure) TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

DILUTE GRAMS Pb BASIS

Meter Reading Corrected (MRC)

Std. (ppm)	HNU 1		HNU 2		HNU 3		HNU 4	
	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	3.1	2.6	4.2	3.9	3.2	3.7	3.4	3.0
5	11.6	9.8	14.7	12.9	12.0	13.8	12.3	10.1
10	21.7	17.6	25.6	21.7	21.6	24.8	21.5	18.2
15	31.7	26.6	36.6	31.7	31.6	36.6	31.5	25.6
20	39.7	34.6	47.6	39.7	40.6	45.6	39.5	31.6
25	47.7	41.6	55.6	48.7	49.6	55.6	46.5	38.6
Accept all data								
Slope	1.9094	1.6643	2.2215	1.9070	1.9665	2.2084	1.8613	1.5186
MRC intercept	1.48	0.90	2.21	1.95	1.31	1.72	1.89	1.67
Cor. coef.	0.9978	0.9991	0.9973	0.9979	0.9990	0.9982	0.9967	0.9969
Linear eqn. Conc. (ppm)	$\frac{MRC-1.48}{1.9094}$	$\frac{MRC-0.90}{1.6643}$	$\frac{MRC-2.21}{2.2215}$	$\frac{MRC-1.95}{1.9070}$	$\frac{MRC-1.31}{1.9665}$	$\frac{MRC-1.72}{2.2084}$	$\frac{MRC-1.89}{1.8613}$	$\frac{MRC-1.67}{1.5186}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-1.19}{1.7869}$		$\frac{MRC-2.08}{2.0643}$		$\frac{MRC-1.52}{2.0874}$		$\frac{MRC-1.78}{1.6800}$	
Rel. response (% C_6H_6)	192.4	167.3	224.4	192.6	198.0	222.6	188.0	153.5
Ave. Rel. Resp. (% C_6H_6)	179.9		208.5		210.3		170.8	
Working Range								
Meter Reading Corrected (MRC)	2 - 50		3 - 75		2 - 50		2.5 - 50	
Tetraethyl lead (approx. ppm)	0.45 - 25		0.45 - 25		0.25 - 25		0.25 - 25	

TETRAETHYL LEAD $(CH_3CH_2)_4Pb$ MW 323.4 (pure) TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

MOTOR MIX

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	2.7	2.4	3.4	2.9	3.4	2.8	2.9	
5	4.4	3.9	5.2	4.2	4.9	4.1	4.2	
10	4.8	4.2	5.2	4.1	5.0	4.2	4.6	data
15	6.8	5.7	7.6	6.1	7.1	5.9	6.3	
20	4.8	4.7	6.6	6.1	5.9	6.2	5.5	not
25	7.8	6.8	8.8	6.6	8.3	8.4	7.2	
								valid

Accept all data despite obvious discrepancies. THIS TEST SERIES SHOWS POOR RESPONSES

	HNU 1 - 1.	HNU 1 - 2.	HNU 2 - 1.	HNU 2 - 2.	HNU 3 - 1.	HNU 3 - 2.	HNU 4 - 1.
Slope	0.2285	0.2045	0.2684	0.2136	0.2437	0.2627	0.2198
MRC intercept	1.99	1.74	2.34	1.97	2.30	1.66	2.00
Cor. coef.	0.8495	0.8790	0.8827	0.8827	0.8656	0.9354	0.8803
Linear eqn. Conc. (ppm)	$\frac{MRC-1.99}{0.2285}$	$\frac{MRC-1.74}{0.2045}$	$\frac{MRC-2.34}{0.2684}$	$\frac{MRC-1.97}{0.2136}$	$\frac{MRC-2.30}{0.2437}$	$\frac{MRC-1.66}{0.2627}$	$\frac{MRC-2.00}{0.2198}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-1.86}{0.8642}$		$\frac{MRC-2.16}{0.8827}$		$\frac{MRC-1.98}{0.9005}$		
Rel. response (% C_6H_6)	24.8	22.2	29.2	23.3	26.7	27.9	24.0
Ave. Rel. Resp. (% C_6H_6)	23.5		26.3		27.3		

Working Range

	HNU 1	HNU 2	HNU 3	HNU 4
Meter Reading Corrected (MRC)	2 - 10	2.5 - 10	2.5 - 10	2.5 - 10
Tetraethyl lead (approx. ppm)	0.5 - 25	1.5 - 25	2 - 25	2 - 25

TETRAETHYL LEAD $(CH_3CH_2)_4Pb$ MW 323.4 (pure) TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 Liters

AVIATION MIX

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	2.5	3.1	2.9	3.3	2.8	2.9	2.4	1.9
5	4.3	4.7	5.0	4.9	4.8	4.3	4.0	2.8
10	5.3	5.5	5.7	5.2	5.4	4.6	4.5	3.1
15	5.1	5.5	5.6	5.2	5.6	4.9	4.9	3.2
20	4.6	6.6	6.5	6.2	6.7	5.6	5.6	3.8
25	7.7	8.9	8.9	8.6	9.5	8.2	7.6	5.4

Accept all data despite obvious discrepancies. THIS TEST SERIES SHOWS RELATIVELY POOR RESPONSES

Slope	0.2116	0.2654	0.2646	0.2436	0.2877	0.2356	0.2324	0.1572
MRC intercept	1.95	2.02	2.07	2.13	1.85	1.80	1.62	1.18
Cor. coef.	0.8389	0.9096	0.8991	0.8819	0.9228	0.8995	0.9222	0.9052
Linear eqn. Conc. (ppm)	$\frac{MRC-1.95}{0.2116}$	$\frac{MRC-2.02}{0.2654}$	$\frac{MRC-2.07}{0.2646}$	$\frac{MRC-2.13}{0.2436}$	$\frac{MRC-1.85}{0.2877}$	$\frac{MRC-1.80}{0.2356}$	$\frac{MRC-1.62}{0.2324}$	$\frac{MRC-1.18}{0.1572}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-1.98}{0.2385}$		$\frac{MRC-2.10}{0.2541}$		$\frac{MRC-1.83}{0.2617}$		$\frac{MRC-1.40}{0.1948}$	
Rel. response (% C_6H_6)	23.1	28.6	28.5	26.5	30.6	25.4	24.9	16.9
Ave. Rel. Resp. (% C_6H_6)	25.9		27.5		28.0		20.9	
Working Range								
Meter Reading Corrected (MRC)	2.5 - 10		2.5 - 10		2.5 - 10		2 - 10	
Tetraethyl lead (approx. ppm)	2 - 25		1.5 - 25		2 - 25		3 - 25	

TETRAMETHYL LEAD $(CH_3)_4Pb$ MW 267.3 TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters TML DILUTE

Meter Reading Corrected (MRC)

	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	3.2	2.8	3.8	3.3	3.9	3.4	3.6	3.1
5	12.3	11.5	13.3	12.6	15.3	13.9	13.5	12.9
10	23.9	21.6	25.7	22.6	29.6	23.4	24.6	23.5
15	35.9	33.6	37.7	34.6	41.6	39.4	36.6	35.5
20	43.9	43.6	48.7	45.6	52.6	51.4	46.6	45.5
25	57.9	51.6	60.7	56.6	65.6	63.4	57.6	57.5
Accept all data								
Slope	2.2599	2.0951	2.4009	2.2420	2.5916	2.5321	2.2813	2.2692
MRC intercept	0.76	0.78	1.06	0.70	1.66	0.35	1.30	0.79
Cor. coef.	0.9987	0.9988	0.9996	0.9997	0.9986	0.9989	0.9992	0.9996
Linear eqn. Conc. (ppm)	$\frac{MRC-0.76}{2.2599}$	$\frac{MRC-0.78}{2.0951}$	$\frac{MRC-1.06}{2.4009}$	$\frac{MRC-0.70}{2.2420}$	$\frac{MRC-1.66}{2.5196}$	$\frac{MRC-0.35}{2.5321}$	$\frac{MRC-1.30}{2.2813}$	$\frac{MRC-0.79}{2.2692}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-0.77}{2.1775}$		$\frac{MRC-0.88}{2.3215}$		$\frac{MRC-1.01}{2.5619}$		$\frac{MRC-1.05}{2.2753}$	
Rel. response (% C_6H_6)	226.8	210.3	241.1	224.9	260.8	253.6	229.4	227.7
Ave. Rel. Resp. (% C_6H_6)	218.6		233.0		257.2		228.6	
Working Range								
Meter Reading Corrected (MRC)	1.5 - 75		1.5 - 75		2 - 75		1.5 - 75	
Tetramethyl lead (approx. ppm)	0.25 - 25		0.25 - 25		0.25 - 25		0.25 0 25	

TOLUENE $C_6H_5CH_3$ MW 92.2 TRIAL 1 HNU 2, 3, and 4

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0			0.0	0.0	0.0	0.0	0.0	0.0
20			15.1	15.0	17.5	16.8	15.2	14.8
40			27.3	25.2	31.0	29.8	29.9	28.8
60			37.3	34.2	41.0	39.8	36.9	35.8
80			55.3	55.2	61.0	60.8	53.9	54.8
100			65.3	64.2	70.0	69.8	63.9	63.8
120			90.3	87.2	109.0	103.8	90.9	88.8
140			90.3	85.2	97.0	94.0	88.9	88.8
Reject 140 ppm data all tests								
Slope			0.7130	0.6964	0.8250	0.8007	0.7038	0.6971
MRC intercept			-1.27	-1.64	-2.43	-2.21	-0.69	-0.86
Cor. coef.			0.9928	0.9918	0.9798	0.9854	0.9895	0.9914
Linear eqn. Conc. (ppm)			$\frac{MRC+1.27}{0.7130}$	$\frac{MRC+1.64}{0.6964}$	$\frac{MRC+2.43}{0.8250}$	$\frac{MRC+2.21}{0.8007}$	$\frac{MRC+0.69}{0.7038}$	$\frac{MRC+0.86}{0.6971}$
Ave. lin. eqn. Co. (ppm)			$\frac{MRC+1.46}{0.7047}$		$\frac{MRC+2.32}{0.8128}$		$\frac{MRC+0.78}{0.7004}$	
Rel. response (% C_6H_6)			70.0	68.0	80.1	77.9	69.7	68.9
Ave. Rel. Resp. (% C_6H_6)			69.0		79.0		69.3	
Working Range								
Meter Reading Corrected (MRC)			0 - 100		0 - 100		0 - 100	
Toluene (approx. ppm)			2 - 120		3 - 120		1 - 120	

1,1,1-TRICHLOROETHANE CH_3CCl_3 MW 133.4   TRIAL 1   HNU 1, 2, 3 and 4

MYLAR BAGS   Total volume: 44.0 liters

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	0.75	0.9	0.6	0.4	0.6	0.85	0.5	0.6
100	3.55	2.6	3.3	2.4	3.5	2.9	3.4	2.6
150	4.75	3.7	4.1	2.8	4.7	4.25	4.3	3.9
200	5.55	4.9	5.0	4.65	5.7	5.95	4.7	5.3
250	6.55	7.0	5.5	5.4	7.1	6.05	6.5	6.6
350	8.55	8.6	7.7	7.4	8.8	9.15	8.2	8.1
700	15.55	15.0	14.4	14.0	15.8	15.95	14.3	13.8
1000	18.55	18.2	17.5	16.0	18.6	18.85	18.0	17.9
Accept all data								
Slope	0.0187	0.0186	0.0177	0.0169	0.0189	0.0196	0.0180	0.0178
MRC intercept	1.27	0.98	0.95	0.64	1.33	0.93	1.06	0.98
Cor. coef.	0.9857	0.9870	0.9892	0.9847	0.9824	0.9827	0.9880	0.9889
Linear eqn. Conc. (ppm)	$\frac{MRC-1.27}{0.0187}$	$\frac{MRC-0.98}{0.0186}$	$\frac{MRC-0.95}{0.0177}$	$\frac{MRC-0.64}{0.0169}$	$\frac{MRC-1.33}{0.0189}$	$\frac{MRC-0.93}{0.0196}$	$\frac{MRC-1.06}{0.0180}$	$\frac{MRC-0.98}{0.0178}$
Ave. linear eqn. Co. (ppm)	$\frac{MRC-1.13}{0.0187}$		$\frac{MRC-0.80}{0.0173}$		$\frac{MRC-1.13}{0.0193}$		$\frac{MRC-1.02}{0.0179}$	
Rel. response (% C_6H_6)	3.1	2.8	2.7	2.2	3.2	2.9	2.8	2.8
Ave. Rel. Resp. (% C_6H_6)	3.0		2.5		3.1		2.8	
Working Range								
Meter Reading Corrected (MRC)	1.5 - 25		1 - 25		1.5 - 25		1.5 - 25	
1,1,1-Trichloroethane (app. ppm)	20 - 1000		10 - 1000		20 - 1000		25 - 1000	

TRIMETHYLAMINE $(CH_3)N$ MW 59.1

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 20 ppm

TURPENTINE mainly $C_{10}H_{16}$ MW appr. 136 TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	22.6	20.4	22.2	23.0	19.4	17.8	21.8	20.4
100	39.6	37.4	43.2	40.0	42.4	30.8	39.8	40.4
200	71.6	68.4	76.2	73.0	72.4	67.8	76.8	72.4
500	129.6	140.4	176.2	175.0	142.4	139.8	150.8	146.4
1000	198.6	208.4	258.2	278.0	188.4	197.8	192.8	198.4

Reject 1000 ppm data all tests

	HNU 1, 1.	HNU 1, 2.	HNU 2, 1.	HNU 2, 2.	HNU 3, 1.	HNU 3, 2.	HNU 4, 1.	HNU 4, 2.
Slope	0.2496	0.2742	0.3465	0.3442	0.2776	0.2777	0.2954	0.2861
MRC intercept	10.25	6.71	4.66	3.69	8.12	4.03	7.63	7.28
Cor. coef.	0.9858	0.9952	0.9988	0.9994	0.9914	0.9961	0.9933	0.9942
Linear eqn. Conc. (ppm)	$\frac{MRC-10.25}{0.2496}$	$\frac{MRC-6.71}{0.2742}$	$\frac{MRC-4.66}{0.3465}$	$\frac{MRC-3.69}{0.3442}$	$\frac{MRC-8.12}{0.2776}$	$\frac{MRC-4.03}{0.2777}$	$\frac{MRC-7.63}{0.2954}$	$\frac{MRC-7.28}{0.2861}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-8.48}{0.2619}$		$\frac{MRC-4.18}{0.3454}$		$\frac{MRC-6.08}{0.2777}$		$\frac{MRC-7.46}{0.2908}$	
Rel. response (% C_6H_6)	35.2	34.1	39.3	38.1	35.9	31.8	37.2	35.9
Ave. Rel. Resp. (% C_6H_6)	34.7		38.7		33.9		36.6	
Working Range								
Meter Reading Corrected (MRC)	15 - 150		10.- 200		10 - 150		10 - 200	
Turpêntine (approx. ppm)	25 - 500		15 - 500		15 - 500		10 - 500	

VINYL ACETATE $CH_3CO_2CH=CH_2$ MW 86.05 TRIAL 1 HNU 1, 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

	Meter Reading Corrected (MRC)							
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.7	0.2	-0.1	0.0	0.0	0.1	0.7	0.1
10	1.0	1.2	1.3	1.4	1.3	1.3	1.4	1.3
20	0.7	0.9	0.9	1.1	1.2	1.2	0.9	1.0
50	6.0	6.5	7.3	7.4	7.0	7.1	7.1	7.2
100	5.3	5.6	6.3	6.4	6.0	6.1	6.1	5.9
250	9.5	10.0	10.5	11.2	10.7	10.8	10.5	10.6

Accept all data despite obvious discrepancies. THIS TEST SERIES SHOWS RELATIVELY POOR RESPONSES

Slope	0.0369	0.0392	0.0417	0.0441	0.0419	0.0423	0.0405	0.0415
MRC intercept	1.02	1.05	1.15	1.19	1.14	1.17	1.29	1.15
Cor. coef.	0.9125	0.9051	0.8850	0.8999	0.9032	0.9025	0.8969	0.8940
Linear eqn. Conc. (ppm)	$\frac{MRC-1.02}{0.0369}$	$\frac{MRC-1.05}{0.0392}$	$\frac{MRC-1.15}{0.0417}$	$\frac{MRC-1.19}{0.0441}$	$\frac{MRC-1.14}{0.0419}$	$\frac{MRC-1.17}{0.0423}$	$\frac{MRC-1.29}{0.0405}$	$\frac{MRC-1.15}{0.0415}$
Ave. lin. eqn. Co. (ppm)	$\frac{MRC-1.04}{0.0381}$		$\frac{MRC-1.17}{0.0429}$		$\frac{MRC-1.16}{0.0421}$		$\frac{MRC-1.22}{0.0410}$	
Rel. response (% C_6H_6)	4.7	5.0	5.3	5.6	5.3	5.4	5.3	5.3
Ave. Rel. Resp. (% C_6H_6)	4.85		5.45		5.35		5.3	

Working Range

	HNU 1	HNU 2	HNU 3	HNU 4
Meter Reading Corrected (MRC)	2 - 10	2 - 10	2 - 15	2 - 15
Vinyl acetate (approx. ppm)	20 - 250	20 - 250	20 - 250	20 - 250

VINYL CHLORIDE $CH_2=CHCl$ MW 62.05

TRIAL 1 HNU 1, 2, 3 and 4 MYLAR BAGS

Total volume: 44.0 liters

No response

Range: 0 - 25 ppm

o-XYLENE $C_6H_4(CH_3)_2$ MW 106.2 TRIAL 1 HNU 2, 3 and 4

MYLAR BAGS Total volume: 44.0 liters

			Meter Reading Corrected (MRC)					
	HNU 1		HNU 2		HNU 3		HNU 4	
Std. (ppm)	1.	2.	1.	2.	1.	2.	1.	2.
0			0.0	0.0	0.0	0.0	0.0	0.0
20			8.5	8.0	7.7	6.9	7.6	7.1
40			19.6	21.0	17.8	18.5	20.1	19.8
60			33.6	33.0	27.8	28.5	30.1	29.8
80			37.6	35.0	32.8	30.5	34.1	31.8
100			43.6	42.0	35.8	35.5	36.1	34.8
200			78.6	78.0	69.8	66.5	66.1	64.8
500			183.6	183.0	147.8	143.5	148.1	145.8
Accept all data								
Slope			0.3595	0.3587	0.2896	0.2802	0.2866	0.2827
MRC intercept			5.70	5.16	6.23	6.22	6.95	6.40
Cor. coef.			0.9977	0.9981	0.9959	0.9958	0.9955	0.9958
Linear eqn. Conc. (ppm)			$\frac{MRC-5.70}{0.3595}$	$\frac{MRC-5.16}{0.3587}$	$\frac{MRC-6.23}{0.2896}$	$\frac{MRC-6.22}{0.2802}$	$\frac{MRC-6.95}{0.2866}$	$\frac{MRC-6.40}{0.2827}$
Ave. lin. eqn. Co. (ppm)			$\frac{MRC-5.43}{0.3591}$		$\frac{MRC-6.23}{0.2849}$		$\frac{MRC-6.67}{0.2847}$	
Rel. response (% C_6H_6)			41.6	41.0	35.2	34.2	35.6	34.7
Ave. Rel. Resp. (% C_6H_6)			41.3		34.7		35.2	
Working Range								
Meter Reading Corrected (MRC)			10 - 200		10 - 150		10 - 150	
o-Xylene (approx. ppm)			10 - 500		10 - 500		10 - 500	